Volume 15, Number 2
FEBRUARY 1954

Postgraduate Medicine

Official Journal
of the Interstate
Postgraduate
Medical Association

A Unified Program of Postgraduate Education

The Medical, Surgical and Pediatric Clinics of North America

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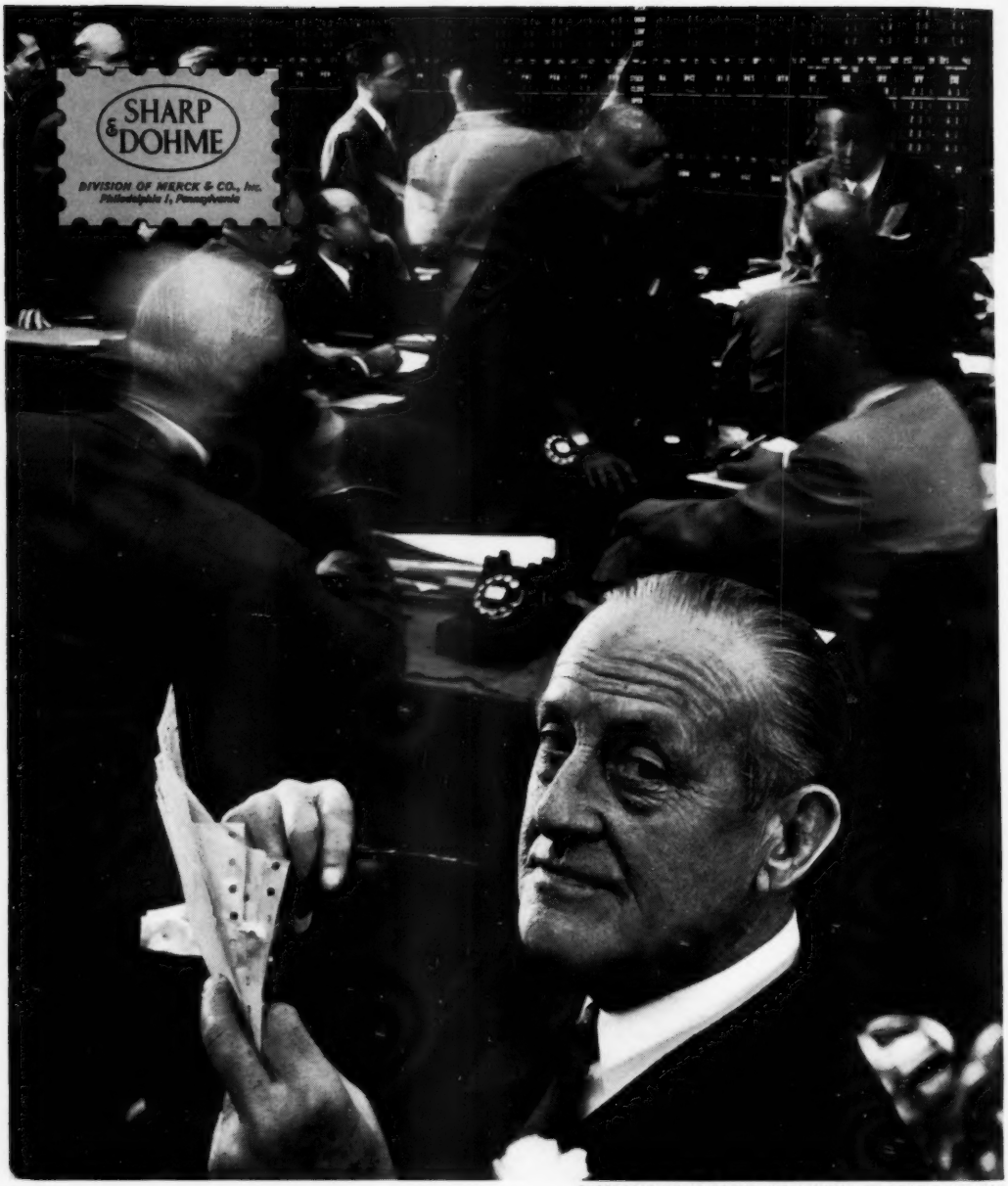

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OFFICIAL JOURNAL OF THE INTERSTATE POSTGRADUATE MEDICAL ASSOCIATION

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Management of Emergencies During the Third Stage of Labor and in the Immediate Puerperium

ISADORE DYER*

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The major causes of third stage complications are discussed in this article. Emphasis is directed to the causes of hemorrhage which may develop from uterine origin, trauma or abnormal states of the placenta. Experiences with both amniotic fluid and air emboli are developed, and the article completes the survey of the complications with discussion on cardiac decompensation and afibrinogenemia.

ISADORE DYER

ALTHOUGH trite on casual consideration, the third stage of labor, with its numerous complications, remains not only the cause of many maternal deaths each year but also a challenge to every physician who accepts a woman for care during her delivery.

Granting that adequate prenatal care and knowledge of the general physiology of the patient herself are not directly within the scope of this discussion, it would be incomplete if some small emphasis were not placed on their importance. Since every woman who undertakes labor is in danger of excessive demands over and above her normal capacity, it is vital to her welfare that her physician know her cardiac and blood status as well as the general facility with which she has withstood pregnancy. Certainly, of equal importance would be knowledge of any complicating diseases in pregnancy and a minute record of past obstetric performances.

In our own experiences, the tragedies that have occurred in cases where women have bled before or during labor and in cases of the grand multipara, the cardiac or diabetic, the toxemias, the prolonged labors, the oversized baby, the rare presentations and the multiple pregnancies have made us conscious of some basic observations and procedures which have reduced maternal risks.

Whereas anyone may read any standard textbook on obstetrics for the classic outline of third stage care and, by the same means, observe statistics relative to the accounts of others, I shall outline our own philosophy from personal experiences. These experiences include the patients delivered on the Tulane

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

unit at the Charity Hospital in New Orleans and three other large hospitals* staffed by our residents and supervised by our consultant staff. With almost 12,000 deliveries in New Orleans each year and an additional 4500 out of town, one can soon observe, respect and learn to recognize the seriousness of the proper management of the third stage of labor and its complications.

Statistics are often misleading. Therefore, quoted instances are often worthless. It takes only a few patients to radically change a percentage of occurrence of the rare complications. Conversely, the more common complications do exist but may be overlooked or unfound because of the insufficiency or absence of postmortem study.

Definition

By definition, the third stage begins as soon as the baby is delivered, and ends with the birth of the placenta. The immediate puerperium may be defined as that period beginning at the end of the third stage of labor and ending in 1 to 24 hours, or until the patient has recovered from the early effects of anesthesia and the threat of early hemorrhage, or, in other words, functions with relatively normal physiology. The discussion will then include this entire period.

Complicating Factors

Hemorrhage (table 1)—Foremost in importance and frequency, hemorrhage is a constant threat to all parturient women. Blood loss may be excessive from uterine origin, trauma or placental causes.

Uterine bleeding caused by loss of muscle tone or atony may be anticipated in any prolonged labor, overdistention (multiple pregnancy, excessively large babies and polyhydramnios), where long or deep anesthesia is employed, where large or multiple fibroids are present, in concealed abruptio placentae where extravasation of blood into the uterine wall produces uterine apoplexy (Couvelaire uterus), and following the use of PITOCIN® drips during labor which are discontinued on birth of the baby. Other causes of blood loss from the uterus are uterine rupture and, in rare examples, inversion of the uterus.

TABLE 1

CAUSES OF THIRD STAGE COMPLICATIONS

- HEMORRHAGE
  - Uterine origin
    - Atony
      - Prolonged labor
      - Overdistention
      - Anesthesia
      - Tumors
      - Couvelaire (apoplexy)
      - Intravenous Pitocin drip
    - Rupture
    - Inversion
  - Trauma
    - Vaginal
    - Cervical
    - Concealed hematoma
  - Placenta
    - Concealed fragments (extra lobes)
    - Placenta previa
    - Premature separation (abruptio)
    - Placenta accreta
- EMBOLI
  - Amniotic fluid
  - Air
- CARDIAC DECOMPENSATION
- AFIBRINOGENEMIA

Hemorrhage may occur external to the uterus and be created by cervical and/or vaginal lacerations. Concealed hematomas, extensive enough to cause death, may extend above the vagina and, by retroperitoneal approach, dissect into the abdomen.

The placenta participates in initiating hemorrhage where fragments are concealed, an extra lobe (succenturiate) remains following incomplete placental expulsion, and in instances of premature separation (abruptio), placenta previa and placenta accreta.

Embolic phenomena—We have reported deaths from two air and three amniotic fluid emboli.[1] It is suspected that these complications occur more often than previously reported. At Charity Hospital[2] from 1942 to 1949, 56,945 women were delivered. During this period there were 1.9 maternal deaths per thousand and no amniotic fluid emboli were found (table 2). However, since 1950 this

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TABLE 2

MATERNAL DEATHS
(Charity Hospital, New Orleans)

TOTAL DELIVERIES	MATERNAL DEATHS *(Per thousand*)*	AMNIOTIC FLUID EMBOLUS *(Percentage of total deaths)*
56,945 1942-1949	1.9	0
22,393 1950-1951	1.21	11.1

*Uncorrected.

cause of sudden death has been sought. In a two year period (22,393 deliveries) there were 1.21 maternal deaths per thousand and 3 of those deaths were proved to be due to amniotic fluid emboli. This represented 11.1 per cent of the total maternal deaths. One can only surmise that, in the past, many unexplained deaths labeled "etiology unknown" or "anesthetic death," with questionable autopsy conclusions, may have been due to amniotic fluid emboli. One of the three patients developed alarming shocklike symptoms 40 minutes after delivery and, in spite of treatment, died an hour later.

The air emboli occurred during an unsuccessful attempted manual removal of a retained placenta, which was later proved to be a placenta accreta, and in manual removal of a twin placenta.

Cardiac failure—In accordance with the extent of cardiac disease present and the type of pregnancy, the cardiac patient will usually exhibit maximum strain which reaches a peak at the twenty-eighth week of gestation. This has been observed by studies of blood plasma volume, cardiac output, stroke volume, cardiac hypertrophy, etc. There is somewhat of a decreased cardiac load and an increase in cardiac efficiency from the twenty-eighth week until delivery. Following birth, the cardiac load assumes a level almost equal to that of the twenty-eighth week. Therefore, a critical stage is suddenly approached immediately after delivery and remains for as long as two weeks. Decompensation is a threat, and death has marred what often seemed to appear as a successful outcome.

Afibrinogenemia—Initiated by many factors, such as injury, shock, blood transfusion, amniotic fluid and long-standing fetal death, afibrinogenemia is one of the most serious entities to combat.[3] In pregnancy it has been shown that the placenta (particularly in examples of premature separation), by autolysis of decidual and placental tissue, may liberate excessive amounts of thromboplastin into the blood stream (figure 1). When this happens, the thromboplastin converts prothrombin into thrombin, which in turn acts to change fibrinogen into fibrin. As a result, the fibrinogen blood level drops (normal 200 to 400 mg.) and fibrin is deposited throughout the tissues.

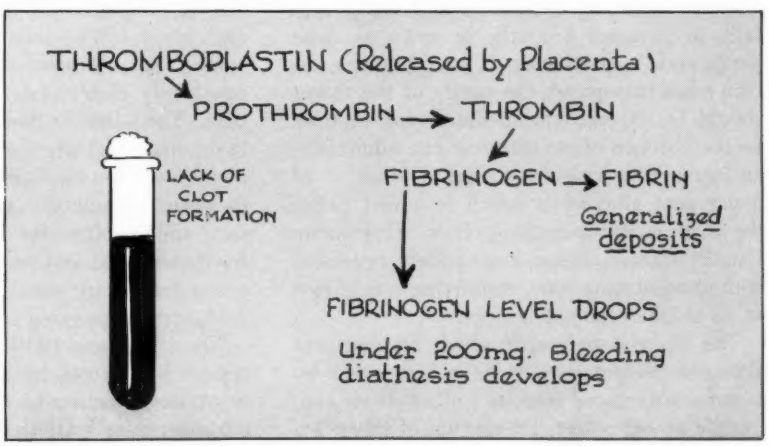

FIGURE 1.

When the fibrinogen level falls below 200 mg. a bleeding diathesis develops, and the patients bleed from every cut surface and may bleed from the uterus, bladder, gums and lungs. The coagulant activity in amniotic fluid will produce a like condition.[4] A sample of blood drawn will fail to form a clot.

Management

Hemorrhage due to uterine atony may be anticipated. Certainly where one encounters an overdistended uterus or prolonged labor, means for transfusion should be available in advance.

Prolonged labor of serious degree is often neglected labor. The jeopardy to both mother and baby can be radically reduced by early evaluation and action.

In 1940 Davis[5] described a method of conducting the third stage, and we have used it ever since. It consists of the administration of 0.2 mg. (1/320 gr.) of ergonovine, given intravenously as soon as the anterior shoulder comes into view. One then allows 20 to 30 seconds to elapse, and the baby is delivered. The uterus contracts, separating the placenta and pushing it into the lower uterine segment and vagina. Blood loss is minimal as a rule. Lately, we have used METHERGINE® with equal results. This method is especially beneficial in patients with anticipated atony. Where deep anesthesia has been necessary, either Methergine or ergonovine may be used to prevent bleeding following the third stage.

When bleeding continues and the uterus fails to contract properly in spite of these drugs and, in particular, if any operative delivery has transpired, the cavity of the uterus should be explored immediately for rupture. In the absence of rupture one can administer an intravenous drip consisting of 1000 cc. of 5 per cent glucose to which is added (after the drip is in operation) 1 cc. of Pitocin. Usually one is almost immediately rewarded with good uterine tone, employing a drip rate of 30 to 60 drops per minute.

The Couvelaire uterus which accompanies abruptio placentae may be so impaired by blood extravasated into its walls that its contractile power is lost. Prevention of this often fatal condition lies in the early diagnosis and treatment of the placental separation. Commonly occurring in toxemias, and even more certainly in eclampsia, early recognition of the condition is aided by a firm uterus which does not relax and may increase in size, pain (not dependable) in one area of the uterus, a sign of blood loss (low hematocrit, anemia, shock state), lowered blood fibrinogen, and often no signs of fetal life. In our experience, immediate delivery is vital to the mother's welfare. This may be accomplished vaginally if there is enough cervical dilation and uterine contractility to assure early delivery. If not, we employ surgical approach via cesarean section whether the baby is alive or dead.

In 1949, three mothers died on our service from this complication; in 1950, one; and none since these policies have been practiced. Even if the baby is delivered vaginally, such uteri may fail to contract and massive hemorrhages occur. This reaction denotes the presence of a uterus so impaired that it may be unable to respond to oxytocic drugs, massage or packing. Failure of the blood clotting mechanism will complicate the picture.

The treatment, therefore, for persistent uterine atony—whether due to simple failure of an otherwise normal uterus to contract, a uterus impaired with multiple fibroids or a Couvelaire uterus which fails to respond—is hysterectomy and blood replacement. When discovered, uterine rupture requires immediate surgery.

Uterine packing has been employed only once since 1946—following delivery of twins when deep anesthesia was necessary. We have practically eliminated the use of the uterine pack. Too often in the past, packs were used in undiagnosed uterine rupture and in uteri unable to respond. This procedure only served to delay temporarily the ultimate definitive care and to place the patient in peril. With few exceptions, and perhaps only as an emergency temporary procedure, would a uterine pack serve a purpose in our hands today.

From January 1949 to October 1952, we reported 85 total hysterectomies performed at cesarean section or in the immediate postpartum period.[6] Of the total, 10 were neces-

sary for Couvelaire uteri, 14 when uterine fibroids were present and 6 following uterine rupture. There were 2 deaths in the 85 procedures, both in the above group; one resulted from a neglected, long-standing Couvelaire uterus, and the other from peritonitis following neglected, undiagnosed uterine rupture.

Inversion of the uterus may occur with or without mismanagement of the third stage. It is a frightening experience to all concerned. Early recognition is vital. The maternal shock is usually out of proportion to blood loss. In a review of the literature Bell, Wilson and Wilson[7] found 67 cases. The uncorrected maternal mortality was 17.9 per cent. Management consists of immediate shock measures and replacement of the uterus to its normal state. This may be facilitated by grasping the cervix with multiple sponge forceps and manually replacing the uterus by replacing the fundus to its normal site. In two personal experiences this has been possible. This is one rare exception where a uterine pack may be useful. Surgical replacement by the Huntington operation may be necessary when the inversion is long-standing or when the procedure just described fails.

The cervix should be inspected routinely and lacerations repaired. We use 000 chromic catgut with good result. Vaginal extensions should always be explored, and a well-placed suture at the apex will prevent late or concealed bleeding. In operative deliveries one should explore the vaginal wall for a puncture wound opposite to the episiotomy side and internal to the ischial spine. Even small lacerations in the anterior commissure in the region of the urethra and clitoris can bleed slowly for hours and produce late shock.

Concealed hematomas should be opened, evacuated and the bleeding points secured. In a collected series of 17 such patients at Charity Hospital,[8] the over-all mortality rate was 17.7 per cent. If the hematoma is high in the vagina, it may be hidden. Late postpartum shock develops out of proportion to recognizable blood loss, and laparotomy may be lifesaving. If multiple oozing occurs (occasionally in excessive vaginal varicosities), a snug vaginal pack is useful, accompanied by an indwelling bladder catheter; this will insure hemostasis.

The placenta should be examined routinely. Absence of placental tissue should initiate intra-uterine search. This is particularly significant if a break in peripheral continuity suggests the previous presence of a succenturiate lobe.

In placenta previa, hemorrhage may result from failure of the placental bed in the lower segment to contract. An occasional placenta previa accreta may occur. Since placenta previa is common in twin pregnancies, difficulties may be exaggerated. Here hemorrhage may be initiated from both an atonic, distended uterus and the placental site. Hysterectomy should be considered early.

In premature separation of the placenta, anticipation of the sequelae before mentioned (uterine apoplexy and afibrinogenemia), will reduce maternal complications and may prevent death.

Eastman at Johns Hopkins reported no instances of placenta accreta in 70,000 cases, while Irving and Hertig reported 1 in 1,956 deliveries. We have reported 18 in 144,590 deliveries (1 in 8,032)[9] (table 3). There were 2 maternal deaths (11.1 per cent). One death occurred in the case of a 30 year old Negress, para 12 gravida 12, who gave a history of endometritis following two of her previous deliveries, and following her last baby a retained adherent placenta was removed manually. She was delivered spontaneously by one of the interns, following which the placenta failed to separate. After a 30 minute interval she was seen by both the resident

TABLE 3

PLACENTA ACCRETA

(1937-1953)

	CHARITY HOSPITAL	TOURO INFIRMARY	TOTAL
Deliveries	117,317	27,273	144,590
Placenta accreta	14	4	18
Incidence	1 in 8,379	1 in 6,818	1 in 8,032
Per cent of total deliveries	0.012	0.015	0.012

and staff physician who then planned to explore the uterine cavity with the patient under deep anesthesia. During this procedure, in which more than average force was employed in an effort to effect a line of cleavage, the patient suddenly died. Autopsy findings produced microscopic confirmation of placenta accreta, and this death was considered caused by an air embolism. The other patient, a 24 year old Negress, para 5 gravida 6, was admitted to the hospital following a home delivery and was in profound shock. On intrauterine exploration, a large portion of placental tissue was easily removed. Further exploration revealed "a small piece of adherent placenta which bled rather freely when removal was attempted." Immediate hysterectomy was performed, but the patient remained in shock and died two hours following surgery. The pathologic report on the uterus revealed the presence of placenta increta. There was microscopic confirmation in 15 of the 18 cases; in 3 cases, there was a clinical diagnosis only, because these cases were treated conservatively.

Recognition of this complication is simple. Occurring usually in multigravida—women in whom previous manual removal was necessary—in those having had previous uterine surgery, uterine fibroids or infection, this history, combined with the failure of the placenta to separate plus inability to find a line of cleavage (and I warn of the wisdom of gentle investigation) will establish the diagnosis. Prior to attempted manual removal, it is mandatory that adequate preparations be made for massive transfusion and/or immediate hysterectomy. Immediate hysterectomy is the procedure which offers the best results in our experience. We have yet to muster enough courage to allow a placenta to remain in the uterus for nature's disposal.

The outstanding feature of all deaths caused by amniotic fluid is overwhelming shock occurring during labor or immediately after delivery. This is evidenced by a sudden drop in blood pressure and cessation of radial pulse. All of our patients exhibited restlessness, anxiety and a feeling of impending disaster. A tendency for profuse uterine hemorrhage may develop and be accompanied by afibrinogenemia.

Whereas no known method of prevention has been discovered, the diagnosis can be made from physical signs and by obtaining a specimen of blood from the right heart or vena cava, a method described by Gross and Benz.[10] Immediately after death this specimen, when centrifuged, will separate into three layers (figure 2) instead of the buffy

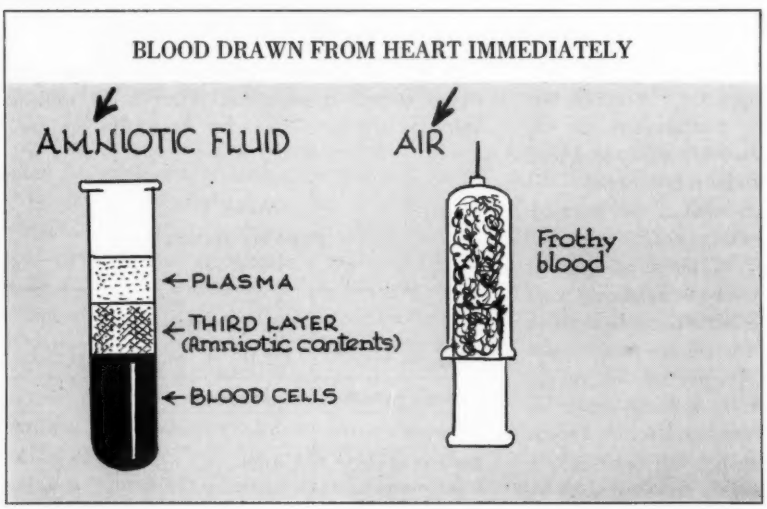

FIGURE 2.

layer and clear layer above the cells otherwise present. The middle layer can be fixed in block and sections will show the presence of amniotic contents. Gross pathologic evidence may be demonstrated in the lungs; the cut surface of the lung may show numerous areas of amniotic and meconium emboli. A smear of this material expressed from cut arterioles may clearly show lanugo hair and debris (figure 3).

Microscopically, emboli may be found in veins and venules of the myometrium and in the arterioles and arteries of the lungs. These emboli consist of keratinized squamous cells with granular acidophilic substance, mucin and lanugo hairs. Areas of atelectasis, emphysema and pulmonary edema are also present.

The reaction in the patient is thought to be anaphylactoid to the contents of amniotic fluid. The hemorrhagic tendency is accounted for by the coagulant activity of amniotic fluid. When it enters the maternal circulation, it immobilizes great quantities of fibrinogen and results in afibrinogenemia. This may cause delayed hemorrhage and, hours later, death.

Treatment consists of early recognition and early administration of fibrinogen and whole blood. In 5 patients with presumptive amniotic fluid embolism reported by Reid, et al.,[4] 4 survived with this regimen. They attributed the recoveries to the restoration and maintenance of normal blood volume and, without undue delay, the restoration of normal blood fibrinogen concentrations with the administration of a minimum of 4 gm. of fibrinogen.

Air embolism produces sudden and dramatic symptoms. The patient exhibits air hunger and becomes dyspneic and cyanotic, the pulse becomes rapid and irregular, the blood pressure unobtainable, and death ensues. The patient will appear restless and, if not anesthetized, complains of retrosternal pain. Clinically this may resemble amniotic fluid embolism, but on auscultation of the heart one may hear a peculiar rushing, gurgling sound caused by the admixture of air and blood.

Methods recommended for treatment of air embolism depend on removal of air from the right ventricle. This must be performed immediately by aspiration either at the tip of the xiphoid or the fifth right interspace.

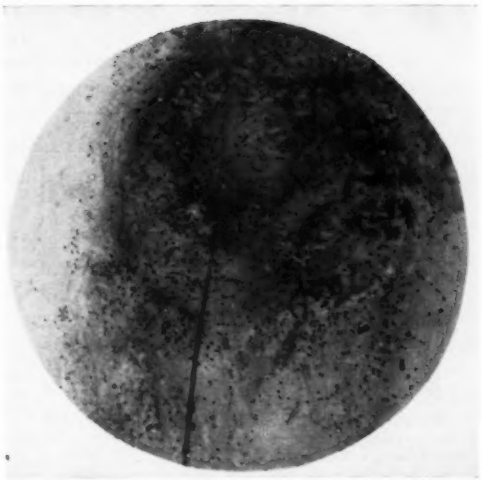

FIGURE 3. Smear from a drop of glistening yellow material expressed from arterioles on the cut surface of the lung, showing lanugo hair and debris in amniotic fluid emboli.

Since air enters the circulation through the large venous sinuses in the placental bed, extreme caution should be practiced in all procedures requiring manual removal of the placenta.

The postpartum cardiac patient should be managed in the same manner as one would handle a nonpregnant individual in whom cardiac failure was anticipated. Replacement of body fluid, glucose or blood, early ambulation, sedation and any disturbing influences should be adjusted to fit the individual tolerance. A postpartum hospital stay of two weeks has lowered complications and deaths on our service.

Afibrinogenemia, heretofore discussed in connection with placental separation, amniotic fluid embolism and long-standing intra-uterine death, is successfully treated in direct ratio to the anticipation, correction of the causative factor and speed with which whole fresh blood and fibrinogen are administered. Whereas as little as 1 to 2 gm. has dramatically corrected the bleeding tendency in some patients, 4 gm. has been necessary for others. If the general

TABLE 4

OBSTETRICS
CHARITY HOSPITAL OF LOUISIANA
(January 1, 1942 to December 31, 1951)

YEAR	DELIVERIES	MATERNAL DEATHS	MORTALITY	
			Percentage	*Per thousand*
1942	5,560	20	0.359	3.59
1943	5,133	19	0.37	3.70
1944*	5,035	17	0.337	3.37
1945	4,653	8	0.171	1.71
1946	7,120	13	0.188	1.88
1947	9,108	16	0.175	1.75
1948	9,763	12	0.120	1.20
1949	10,573	5	0.047	0.47
1950	10,860	16	0.147	1.47
1951	11,533	11	0.095	0.95
TOTAL	79,338	137	0.172	1.72

*Blood bank established.

availability of fibrinogen ever comes to pass, many mothers will be saved from this tragic and usually lethal syndrome.

Conclusion

Thorough patient work-up, combined with adequate histories, will arm the obstetrician with facts which often are important enough to prevent most of the emergencies of the third stage of labor. Alert recognition of a progressing complication will aid to institute early correction. Active and correct treatment of each complication will produce results which will be mirrored in a continued reduction of maternal deaths.

Of all the weapons available today, blood and, in particular, a blood bank is the most valuable. This has been dramatically evident at Charity Hospital. In 1942, of 5,560 deliveries there were 20 maternal deaths, a rate of 3.59 per 1000 (table 4).

In 1951, of 11,533 deliveries there were 11 maternal deaths, a rate of 0.95 per 1000.

One cannot help but believe that the establishment of the blood bank in 1944 must have played a major role in reducing the maternal death rate by 74 per cent.

Readily available blood and an ever conscientious, loyal and alert staff have not reduced the number of complications seen, but have narrowed our maternal deaths, for the most part, to only the grossly neglected or mismanaged women who are dropped in our laps and to severe, bizarre or rare complications. Even in the last types of cases, investigation further lessens the maternal death rate.

Every practicing physician today can do the same things.

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The Etiology of Gastric and Duodenal Ulcers

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Gastric and duodenal ulcers in the majority of cases are believed to be due to an increase in the corrosive properties of the gastric content and not to a local decrease in the resistance of the gastric wall. The increase in the corrosive properties of the gastric content is due to a hypersecretion of gastric juice. In duodenal ulcer patients this hypersecretion is predominantly of nervous origin and is due to the tensions and strain of modern life. It is abolished by a complete vagotomy. The hypersecretion of gastric juice in patients with gastric ulcer is of hormonal origin and is due to a hyperfunction of the gastric antrum in the presence of food in the stomach. This hypersecretion is abolished by excision of the antrum.

LESTER R. DRAGSTEDT

CONTINUED study of the etiology of duodenal and gastric ulcers is important to the improvement of the medical and surgical treatment of these lesions. The disease is commonly termed peptic ulcer, for it is believed to be caused in some way by the corrosive or digestive action of the gastric content. The occurrence of these lesions only in mucous membrane that is exposed to gastric juice is strong evidence in favor of this opinion.

Under normal conditions, the wall of the stomach is not damaged by gastric digestion, but it appears possible that digestion of the mucous membrane, with ulcer formation, might result either from a decrease in the resistance of a local area to the digestive action of the gastric content or from an increase in the corrosive properties of the gastric content, assuming that the resistance of the mucous membrane remains normal.

The first point of view was suggested by the early pathologists and surgeons who studied this problem. In the intervening years, very extensive work was done in an effort to establish a local decrease in resistance by the mucous membrane as the causative factor in the production of peptic ulcer. I believe that these efforts have failed, and that, in the great majority of gastric and duodenal ulcers, a local decrease in the resistance of the mucous membrane to the digestive action of the gastric content is not the factor that causes the disease.

The corrosive properties of the gastric con-

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This work was aided by the Ortho S. A. Sprague Memorial Institutes and the Division of Research Grants and Fellowships of the National Institutes of Health, United States Public Health Service.

Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

tent are due almost entirely to the presence of gastric juice with its free hydrochloric acid and pepsin. Obviously, the corrosive properties of the gastric content will be greater in those patients who secrete excessive amounts of gastric juice as compared with individuals who secrete normal or less than normal amounts. I believe that present evidence is strong that, in both gastric and duodenal ulcer patients, a secretory abnormality in the stomach exists, so that these patients secrete more gastric juice than does the normal individual. In duodenal ulcer patients, a hypersecretion of gastric juice of nervous origin occurs in the fasting stomach, and in gastric ulcer patients, a hypersecretion of gastric juice of humoral origin occurs when food is taken in the stomach.

Physiologists have determined that the secretion of gastric juice in the stomach is brought about primarily by two mechanisms or methods. One is a nervous mechanism, nervous reflexes mediated by the vagus nerves. Impulses, aroused by sight, odor or taste of food, stimulate reflexively the secretory fibers in the vagus nerves to the stomach, and these nerves cause a secretion of gastric juice. This is the so-called nervous phase of gastric secretion and is abolished when the vagus nerves are divided. However, a secretion of gastric juice goes on in response to the presence of food in the stomach even after the vagus nerves have been cut. The mechanism of this type of secretion is humoral, or hormonal, in nature. It is caused by the liberation of a gastric secretory hormone, gastrin, from the mucous membrane of the antrum, or lower fifth of the stomach, when food comes in contact with it. This gastric secretory hormone passes into the blood stream and is carried by the circulation until it reaches the glands in the body and fundus of the stomach which are stimulated to secrete gastric juice.

I am persuaded that the hypersecretion of gastric juice, which is commonly present in patients with duodenal ulcer, is of nervous origin and is abolished if the secretory fibers in the vagus nerves to the stomach are completely divided. I am also persuaded that the hypersecretion of gastric juice which occurs in patients with gastric ulcers and which is responsible for these lesions is of humoral origin. It is due to an excessive liberation of the gastric secretory hormone, gastrin, from the antrum of the stomach, and this hypersecretion may be abolished if the antrum of the stomach is removed.

I shall summarize briefly some of the evidence that supports these opinions. These data have been obtained partly from experiments on laboratory animals and partly from observations in the clinic.

Quantitative studies of the nocturnal gastric secretion in normal individuals and of patients with duodenal and gastric ulcers have been made by the following method: The patient has been placed on a liquid diet for 24 or 48 hours to make sure that there is no solid food in the stomach. At 9:00 P.M. the stomach is emptied by means of an indwelling Levin tube, and constant suction is maintained on that tube until 9:00 A.M. on the following day. The volume of material obtained is carefully measured and its free acid titrated. If the volume is expressed in liters and the free acid concentration in clinical units, the product of the two equals the output of free acid from the stomach in a 12 hour period expressed in milliequivalents. This is the basal or fasting secretion of gastric juice which goes on when the usual physiologic stimulus of food is absent. There is no food in the stomach, and the patient is shielded from the sight, odor or taste of food. Nevertheless, under these basal conditions, a large number of normal people put out an average of 18 mEq. of free hydrochloric acid in the 12 hour nocturnal secretion. Duodenal ulcer patients, on the other hand, put out an average of 60 mEq., or more than three times as much. Many of our duodenal ulcer patients have put out 100, some 200, and a few over 300 mEq. of free hydrochloric acid in a 12 hour period.

There can be no question that this hypersecretion of gastric juice is of significance in the etiology of duodenal ulcer, because if a hypersecretion of gastric juice of this degree is produced in experimental animals, ulcers regularly develop that are exactly the same in appearance and behavior as the lesions

that we find in our patients. This hypersecretion of gastric juice in duodenal ulcer patients is of nervous origin, for it is abolished if the vagus nerves are completely divided. In a series of 300 duodenal ulcer patients, where careful measurements of the fasting secretion were made before and after vagotomy, the free hydrochloric acid output in the fasting night secretion fell to an average of 5 mEq. in the 12 hour period.

Over the years, internists and surgeons have emphasized that a duodenal ulcer is particularly apt to afflict patients whose occupations subject them to long-continued anxiety, stress and strain. It is probable that these tensions and stresses set up a secretory hypertonus in the vagus nerves, resulting in hypersecretion, and that, in this way, the central nervous system plays an undoubted role in the cause of this disease.

It is significant that in most patients with gastric ulcers, the output of free hydrochloric acid in the fasting secretion is about the same as in normal people.

If the vagus nerves to the stomach are completely divided, the hypersecretion associated with duodenal ulcer is permanently abolished, and a return in secretion does not occur through a compensatory action of some other mechanism. Thus, 37 patients with duodenal ulcer who put out an average of 74 mEq. of free hydrochloric acid in the nocturnal gastric secretion before vagotomy, put out only 7 mEq. three years later. Ten patients, who put out an average of 65 mEq. of free hydrochloric acid in the nocturnal gastric secretion before vagotomy, put out an average of 3 mEq. five years later.

Measurement of the continuous, or fasting, secretion of gastric juice in duodenal ulcer patients is of great importance in deciding on surgical therapy and in making a prognosis of results of the operation. As an illustration of the usefulness of this measurement, I shall cite the case of a physician with a chronic duodenal ulcer who consulted me about the wisdom of surgery. A measurement of his nocturnal gastric secretion revealed 358 mEq. of free hydrochloric acid, as compared with 18 mEq. of a normal individual. Adequate medical management to neutralize such excessive night secretion would be so arduous that it would not be long continued, and, as a consequence, continued recurrence would be almost inevitable. Therefore, I advised him that something had better be done to stop the excessive production of acid in his stomach. I am convinced that in duodenal ulcer patients this excessive production of acid is of nervous origin and that the appropriate way to stop it is to cut the vagus nerves to the stomach.

A quantitative measurement of the output of acid in the fasting nocturnal secretion is also very valuable in the care of the patient after the operation. Let me illustrate this point by describing the management of a patient with an intractable duodenal ulcer referred to us for surgical treatment. Three days before the vagotomy, he put out 29 mEq. of free hydrochloric acid in the nocturnal gastric secretion; this rose to 72 mEq. two days before the operation, and to 113 mEq. on the night before surgery. This marked increase in gastric secretion on the night before the operation is a common finding and apparently reflects the anxiety of the patient because of the impending surgical procedure. Following the vagotomy and gastroenterostomy, the stomach is decompressed by means of the indwelling gastric tube for at least five days. Nothing is given by mouth, and the patient is sustained entirely by intravenous injections. The nocturnal gastric secretion is collected after the operation just as was done in the preoperative period. In the patient under consideration here, the output of free hydrochloric acid in the nocturnal gastric secretion fell from 113 mEq. the night before the operation to 7 mEq. on the first night after surgery. Seven mEq. of acid were also put out on the second and third nights after operation and 8 mEq. on the fourth. At a check-up examination six months after the operation, the output of free hydrochloric acid in the 12 hour nocturnal gastric secretion was still 8 mEq. The immediate fall in the secretion of acid is a significant finding and augurs well for the clinical result of the procedures. The determination made six months later is, however,

of much greater significance. It is possible that an immediate reduction in secretion could be due to trauma to some vagus fibers that have not been completely divided. There may appear to be a complete vagotomy in the immediate postoperative period, but some fibers that were only traumatized may recover their ability to transmit impulses so that, at a later period, the hypersecretion of gastric juice may return. Only if the output of free hydrochloric acid in the nocturnal secretion persists at the low level can we be confident of good results.

I have told you that a secretion of gastric juice goes on in the stomach even after the vagus nerves have been completely divided. This secretion can be measured in the dog by making a small stomach pouch, according to the Heidenhain method. The blood supply to the small stomach pouch remains intact, but the vagus innervation has been divided. Nevertheless, when the dog eats food, a secretion of gastric juice occurs from the isolated pouch, and it can be quantitatively recovered and measured for long periods of time. Using these methods, my associates, Woodward and Bigelow, and I demonstrated that removal of the antrum decreases the secretion from the Heidenhain pouch by approximately 85 per cent. This experiment provides strong support for Edkins' gastrin hypothesis and demonstrates that the gastric secretory hormone, gastrin, comes exclusively from the mucous membrane of the antrum of the stomach. After removal of the antrum, food still comes in contact with the mucous membrane of the esophagus, the lesser curvature of the stomach, and the entire intestinal tract. Nevertheless, practically no stimulation of secretion resulted. The importance of these experiments to the surgeon is obvious, since it teaches him that he can practically abolish the secretion of gastric juice from the stomach if he does two things: If he cuts the vagus nerves, and if he removes the antrum of the stomach.

Further support for Edkins' gastrin theory was obtained by transplantation experiments. My associates, Woodward, Oberhelman, Jr., Storer and Smith, and I made an isolated sac of the entire stomach in dogs with blood supply preserved but with the vagus nerves divided. We collected the gastric secretion from these animals quantitatively for a period of two weeks. We then took the antrum out of the isolated stomach sac and transplanted it into the colon as a diverticulum. This was done as a control experiment, and we thought that the transplantation would have no effect. But to our surprise, transplanting the antrum into the colon produced a tremendous stimulation of secretion from the stomach. We then took the antrum out of the colon and transplanted it into the abdominal wall, and the secretion fell off to a low level. We then transplanted the antrum into the duodenum where it could come in contact with food, and again a stimulation of gastric secretion resulted, but not quite as great as when the antrum was in the colon and exposed to fecal material. This made it necessary for us to revise Edkins' gastrin theory. We were forced to admit that the antrum can be stimulated by something besides food.

With the discovery that a hypersecretion of gastric juice could be produced by transplanting the antrum of the stomach into the colon, we asked ourselves: Will this hypersecretion of gastric juice produce an ulcer in experimental animals? This was found to be the case. In a series of dogs the antrum was transplanted into the colon as a diverticulum, and the continuity of the gastrointestinal tract was re-established by anastomosing the stump of stomach with the side of the first part of the jejunum. The upper end of the duodenum was infolded and closed. Large, progressive, perforating ulcers developed near the anastomosis in 80 per cent of the animals so operated on. These ulcers had the sharply punched-out appearance characteristic of the disease that we see in our patients. They are significant because ulcers rarely appear in normal dogs following a gastrojejunostomy or a gastroduodenostomy. Indeed, they rarely or never appear in the normal man following a gastrojejunostomy, but they occur frequently when a gastrojejunostomy or low gastric resection is done in duodenal ulcer patients with nocturnal hypersecretion.

In our early employment of gastric vagotomy in the treatment of duodenal ulcers, ap-

proximately 150 patients with this disease were operated on by vagotomy alone without an accompanying drainage procedure. It was appreciated, of course, that gastroenterostomy had a therapeutic effect on duodenal ulcers so that operations of this type could not be done along with vagotomy if the therapeutic possibilities of the latter procedure were to be determined. In this group of patients, I have been impressed to learn that in seven patients gastric ulcers developed at varying intervals of months or years after the original vagotomy. The vagotomy was complete as evidenced by persistently negative responses to insulin hypoglycemia and by reduction in the fasting night secretions to normal or subnormal levels. In each case the original duodenal ulcer was entirely healed, producing more or less marked pyloric stenosis with retention. It seems probable that this pyloric obstruction with retention of food may have been a factor in the development of these gastric ulcers, since this complication has not been seen in a larger series of 650 duodenal ulcer patients treated by vagotomy and gastroenterostomy. A gastroenterostomy near the pyloric antrum appears to have been effective in preventing a subsequent development of gastric ulcers in these patients. A gastroenterostomy situated near the antrum of the stomach might affect gastric secretion by decreasing both the stasis of food in the stomach and the hypermotility associated with pyloric stenosis.

Some evidence from clinical observation is in harmony with the view that gastric ulcers may be due to antrum hyperfunction. Thus, it has been observed that excision of the gastric antrum (the Madlener operation), or even a gastroenterostomy, is often effective in causing the healing of juxta-esophageal ulcers. In the one case the function of the antrum is entirely removed, and in the other excessive activity as a result of stasis or hypermotility is prevented. Excision of the antrum of the stomach in patients with duodenal ulcers, where the cause of the hypersecretion is nervous, is followed by a high incidence of gastrojejunal ulcers, whereas this complication rarely develops following excision of the antrum in gastric ulcer patients.

Treatment

There are many thousands of patients alive now and free from ulcer disease who formerly were greatly handicapped by intractable duodenal ulcer, and they are well as a result of vagotomy. This is an exceedingly important fact and must be considered in the pathogenesis of duodenal ulcer. It has also been established that a hypersecretion of gastric juice occurs in the fasting stomach of practically all duodenal ulcer patients of a degree which if reproduced in experimental animals, regularly results in ulcer formation. We are on firm ground then in believing that this hypersecretion, which we find in our duodenal ulcer patients, is the cause of the disease. This belief is strengthened by the fact that the hypersecretion is abolished when the vagus nerves to the stomach are completely divided, and that when the hypersecretion is abolished the ulcers regularly heal. A distinction between gastric and duodenal ulcers has gradually become apparent to most authorities on these subjects.

It is proposed that gastric ulcers are also due to a hypersecretion of gastric juice, but in this case the hypersecretion is dependent on a hyperfunction of the antrum or hormonal mechanism of gastric secretion. This may be brought about by the hypermotility associated with pyloric obstruction or by prolonged contact of food with the antrum mucosa, such as may occur with stasis. Other factors, not presently in view, undoubtedly may also play a role in this abnormal antrum function. These interpretations suggest that vagotomy and gastroenterostomy be looked on as the rational definitive treatment for duodenal ulcer and that antrum resection be regarded as the rational treatment for gastric ulcers. The ever-present possibility that the gastric ulcer may be a carcinoma suggests that it should be widely excised along with the antrum.

Cerebral Palsy Research and the Preschool Years

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The preschool years are fundamental in the study and treatment of cerebral palsy. Systematic developmental examination of infant behavior leads to earlier detection of minimal cerebral injury. A developmental approach has mutual value for doctor and family. It promotes better understanding of the problems concerned with diagnosis, guidance and education.

THE American Academy for Cerebral Palsy is pre-eminently committed to the promotion and the utilization of research. By its history and constitution, the Academy is designed to further both knowledge and service. Our awareness of this double responsibility has been sharpened by a fast-rising tide of public interest.

ARNOLD GESELL

The whole problem of human handicap has become an enormous social concern, because it is so closely bound to the concept of democracy. This concern is born of a desire to protect the dignity of the individual. The public is constantly beset with information by radio, television and the press. Never has any people been so extensively urged to come to the aid of the helpless. The mounting interest in cerebral palsy is part of a vast cultural movement which includes the blind, the deaf, the invalids of war, and many other forms of disability and defect.

Scope of Research

It happens that, among all handicaps, cerebral palsy is perhaps the most complex in its origins and in the diversity of its manifestations. Cerebral palsy embraces the total life span from embryo and newborn to the aged. Its known and unknown etiologies and patho-

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Address of the President of the American Academy for Cerebral Palsy at its Seventh Annual Meeting in Fort Worth, Texas, 1953.

genesis include a bewildering array of agencies and mechanisms, ranging from incompatibility of maternal and fetal blood to subtle and gross traumatic damage. Symptoms range from mild and minimal to complete devastation of the child's abilities. Intermediate combinations of normal and defective functions are endless in variety because they involve the most intricately vulnerable organ of the human action system, namely, the cerebral hemispheres.

From a purely medical standpoint, the problems of research are literally inexhaustible. The stream of current literature has grown to such proportions that it can scarcely be encompassed by abstracts and bibliographies. What seems to be needed is an annual or biennial, or even a triennial, critical review which will appraise, interpret and relate the varied studies from multiple disciplines and which will seek out creative trends in the basic sciences.

A critical survey would bring to light the most promising developments in theory and practice. We cannot name the mastermind which might produce such a survey, but a select committee with group thinking could conceivably tackle the task. Suggestive models of critical literature are available in other fields; for example, *Physiological Reviews.*

While a periodic review would be an appropriate activity for this Academy, the undertaking ought to be a cooperative effort with other national organizations concerned with research and its implications for the professions and community.

The community aspects of cerebral palsy are as difficult and baffling as the purely medical phases. They, likewise, call for more systematic research. Every case of cerebral palsy has a highly personal and social setting. Every case inevitably precipitates a mental health situation which involves not only the afflicted child but also the attitudes of parents, brothers, sisters, home, school and community. The preventive control of this complicated web of psychologic factors is an essential research objective. For such control, we need a better understanding of the total problem in its manifold interpersonal relationships, especially those of the family unit. Personality problems arise with great frequency in both young and old. Many who escape the effects of cerebral injury in infancy and childhood are stricken with the palsies and infirmities of advancing age. With the steady lengthening of life expectation, the aged present social and clinical problems of habilitation and of mental hygiene. The study of gerontology is throwing light on these problems, and there are indications that there will be a new medical specialty to render aid in the form of geriatrics.

Pediatrics and the Early Years

Pediatrics occupies the opposite sector of the life cycle where the infirmities of infancy concentrate. Here, the symptoms of cerebral palsies and injuries make their first appearance. It is the pediatrician, as specialist or as general practitioner, who first encounters these symptoms. His role in the detection and developmental supervision of cerebral palsy is often of pivotal importance throughout the infancy and early childhood of the patients. As a kind of family doctor, he can provide long-range coordination, oversight and periodic guidance.

With increased community awareness of the nature of cerebral palsy, educational and social agencies will give more systematic attention to the preschool years. Under a comprehensive pioneering statute, the state of Illinois has already declared that all educable handicapped children from three years of age are entitled to special educational services administered by the Office of the Superintendent of Public Instruction.

Parent-Teacher Associations now include 8,000,000 members, a great force which could be used to further a better comprehension of the nature and needs of handicapped children of preschool as well as of school age. Elementary school teachers likewise can do much to guide the attitudes and reactions of their regular pupils. Normal children, even of young age, show a spontaneous predisposition to aid less fortunate children with obvious handicaps. In many selected cases, it is possible to bring a handicapped child into close associa-

tion with a group of unhandicapped school children, to their mutual benefit. We should welcome the opportunity afforded by such a situation for guiding interpersonal relations and for anticipating civic education. The handicapped we shall always have with us, and school children may as well begin to learn this hard fact in a humane way.

The public tends to visualize the problem of cerebral palsy in the image of a child who goes to a special school with gadgets to relieve his motor disabilities and with a team of experts and teachers to safeguard his welfare. This is a true image, and it would be difficult to name any humanitarian effort which exhibits more devotion and dedicated skill.

But the image is, of course, too limited. It does not include the long stretch of six, seven or eight preschool years. The popular notion persists that educational provisions can wait for school age. From a developmental standpoint the foundational course of education for the handicapped child begins with infancy and is most formative throughout the earliest years. And when the potentials for later academic education are meager or absent, the earliest years are still the most critical period for parents and child. Too often for the anxiety-stricken family, it is a period of distressing emotional adjustments, filled with excessive gloom, recurrent hopes and confusions, or a gnawing sense of solitariness. Some of this loneliness can be lightened by a developmental approach which begins with infancy and which centers attention away from the handicap and toward the remaining growth potentials.

There are three simple reasons why the early years of the handicapped life are supremely significant for cerebral palsy research and for programs of care and education:

1. The major origins of cerebral palsy (and injury) trace to prenatal and circumnatal factors.

2. The genesis and evolution of symptoms can be investigated most advantageously in infancy.

3. Early and cumulative diagnosis facilitates all supervisory and guidance measures and helps the family toward an optimal, realistic acceptance of the child's handicap.

Every infant, whether normal, handicapped or a victim of mixed normality and defect, is confronted with the task of achieving an allotted measure of maturity. We cannot understand him unless we know something of his growth potentials and his growth patterns. The cerebral palsies of children are endless in variety, but all of them are subject to the criterion of development.

The Concept of Development

The very diversity of the underlying pathology points to the integrating value of the concept of growth and development in the interpretation of causes and consequences. Development is a monistic concept which helps to resolve the dualities of organism and environment, structure and function, psyche and soma. It is a key concept.

Far from being a mere abstraction, development is also one of the most intricate realities in nature. It is a life process which can be investigated by scientific method. In the child, this process manifests itself in a lawful ontogenetic sequence of signs: anatomic, physiologic, behavioristic. These signs are open to inspection, measurement and appraisal. They justify the proposition that *development as well as disease falls within the scope of clinical medicine.*

It follows that a clinical science of child development is essential for the elucidation of many aspects of cerebral injury. Such a science is now actively in the making, and it is drawing its materials and methods from a wide variety of fundamental disciplines, including anthropology, psychiatry, psychology and the basic preclinical fields, notably chemistry and embryology. Since interscience relations are reciprocal, studies of cerebral palsy will continue to enrich our knowledge of normal and abnormal child development.

Developmental Diagnosis of Behavior

Behavior signs constitute the most comprehensive and revealing indications of the developmental status of infant and child. Developmental diagnosis utilizes graded functional tests of behavior to determine maturity and

integrity of the total action system. Ideally, this involves a formalized examination of behavior patterns under favorable conditions which elicit optimal responses to stimulating test objects. In essence and principle, such tests are comparable to those of clinical neurology. A neurologic examination investigates the infant's nervous system as the generator and machine of behavior. A developmental examination of infant behavior explores motor, adaptive, language and personal-social functions. It reveals the child in his totality as an individual reacting to a life situation. The examiner does not attempt to derive a numerical intelligence quotient which would be rather meaningless. He is concerned with the flow, the adaptiveness and the shapes of the patterns of behavior and their constellation.

This type of behavior analysis is especially effective in the preschool years when growth is most rapid. It is indispensable for the early recognition of minimal cerebral injuries which are not readily disclosed by conventional neurologic tests. A wider study of these restricted injuries is a very important area for cerebral palsy research. In the absence of routine developmental examinations of presumably normal infants, there is more danger of underestimating rather than overestimating the prevalence of cerebral injury.

Minimal Cerebral Injury

The concept of minimal injury has been gradually forced on us by our clinical experience with atypical infants and also by developmental study of their patterns of visual behavior. The minimal injury group consists of those infants who make a slow or delayed recovery or who present persisting behavior deviations consequent to inferred injury. Fortunately, the behavior signs show a tendency to resolve or diminish during the first three to five years. The risk of permanent residuals is least in children of superior endowment and high growth potentials.

Although there is a general tendency toward amelioration, even mild neurologic lesions may set up a complicated interaction of dynamic forces, with serious distortions of personality. This may well account for a fraction of personality disorders that are not psychogenic in origin. Remote effects may show themselves in difficulties of eye-hand coordination at the time of school entrance. An undetermined but significant fraction of reading disabilities can be ascribed to obscure minimal injuries which damage perceptual organization.

The analytic study of their perceptual processes can lead to a better understanding of minimal, selective cerebral palsies. Refined methods of clinical psychology are available for intensive application in the major sensory areas. They constitute a basic approach to an extremely promising field of research. Here again the developmental factors of perception as they come to expression in the infant and nursery school years are of special clinical significance. Adequate developmental data should enhance certain neuropathologic studies made possible through the brain registry of the Academy.

Visual perception and visual motor coordination are supremely important in normal mental development. It is noteworthy that in many cases of cerebral palsy the visual system itself is relatively intact, both sensory and motorwise. In other instances, it shares in the associated impairments. This fact carries implications for both diagnosis and treatment. When oculomotor controls are unimpaired, perhaps they should be put to fuller uses by the child for purposes of communication with persons and contacts with the environment.

Events which take place in the seeing eye and the retina are closely related to brain activity. They are open to fairly intimate observation through ophthalmologic technics and analytic optometry. They can be interpreted not only from the standpoint of refractive conditions but also as behavior signs which give indication of the status of the total action system. The visual research unit of the Institute at New Haven is already making routine analysis of the visual behavior patterns as part and parcel of a broadened developmental examination. The procedures are adapted to infants as well as to children of older ages. The functions tested include fixation, eye following, mobility of accommodation, ocular pickup and

convergence, associated postural and prehensive response, and visual adjustment to far, near and intermediate space as registered by the retinal reflex. The retinoscope in expert hands becomes a useful tool for adjudging the maturity and integrity of the child's orientation to visual space and his competence in shifting from near to more remote targets. Studies in this field are, of course, preliminary, but they suggest that visual behavior patterns have a high degree of individuality. The patterns tend to comport with individual variations among normal children, with developmental level in primary aments and with specific deviations in certain cases of cerebral injury. And once again, the developmental approach proves more revealing and trustworthy than a purely categorical approach. Developmental optics is concerned with the organization of visual functions in their dynamic relation to the growth of the total action system.

General Conclusion

Development is a key concept. It leads to the coordination of data from a wide diversity of investigations.

A science of normal child development is basic to an understanding of the handicaps produced by cerebral injury whether mild, severe or selective.

Pediatrician, child neurologist and clinical psychologist are obliged to appraise the patterns and potentials of growth, particularly the growth of mind and personality.

The concept of development also has constructive, orientational values for therapist, teacher, social worker and the family. It helps all concerned to see and envisage the problems of care and education in truer perspective.

This makes the preschool years, including infancy, of critical importance in policies of research and of treatment programs.

The public has a new stake and a new interest in research. It senses the possibility that much more can be done in behalf of disabled children. The normal aspects of cerebral palsy, however, are sometimes overemphasized in a manner which obscures the underlying developmental factors. From the standpoint of public relations it would seem wise to encourage a realistic recognition of these factors. The attitudes and insight of the public will inevitably influence the directions of continuing research.

A developmental approach, therefore, has social as well as clinical implications. It favors gradual and progressive procedures in diagnosis, supervision, therapy and education. It promotes mutual understanding between the professions and the family. A developmental philosophy, moreover, protects mental health and spiritual values, for it adheres to the ideal that, in a democracy, every child, normal or handicapped, is entitled to an ample realization of his growth potentials.

DIAGNOSTIC CLINIC

Regional Enteritis: Medical and Surgical Considerations

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Regional enteritis is a disease of unknown cause. Medical treatment is the one of choice, except for those complications which justify surgery. Most patients should be treated medically for a long time before surgical measures are attempted.

CHARLES W. MAYO

REGIONAL enteritis is a disease of which the cause is unknown. It was first described as an entity by Drs. Crohn, Ginzburg and Oppenheimer in 1932; they called it "terminal ileitis." In their report of 13 cases of terminal ileitis there was no mention of simultaneous involvement of the colon. Some of the patients, however, had fistulas, but it was thought that these fistulas were attributable to the inflammation in the ileum rather than to additional involvement of the colon itself.

There is good reason for calling this condition "regional enteritis." Regional enteritis might be defined as a chronic, nonspecific, granulomatous inflammation, primarily of the terminal portion of the ileum, but it may spread upward, in skip areas, into the jejunum, or it may also go downward through the ileocecal valve and the cecum and even include the entire colon. It has been estimated that the incidence of the disease is about half that of ulcerative colitis.

So, among the very few things that we can say of a positive nature about regional enteritis (and the same thing can be said about ulcerative colitis) is that we do not know its cause. In spite of a lot of laboratory work and in spite of the collection of great numbers of cases, we are still unable to find the causative agent.

In about 50 per cent of the cases of regional enteritis that we see, the disease process is still confined to the terminal part of the ileum. In about 90 per cent of the remaining cases it involves the colon, while in the other 10 per cent it does not involve the colon but extends upward from the ileum into the jejunum by

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

skip areas, normal bowel being present in between the areas of involvement.

I do feel that there is some relationship between ulcerative colitis and regional enteritis; both have a neurogenic factor, which is quite important from the standpoint of treatment. Because this disease is on a nonspecific, unknown basis from the standpoint of cause, the study of both chronic ulcerative colitis and regional enteritis has to be on a clinical basis, and the variability in degrees of severity requires that we study larger series. To obtain larger series it is necessary that all cases be studied in detail and reported, because the individual physician is likely to encounter relatively few cases.

What we are really interested in is this: When we do have good results, either from medical therapy or from some type of operation which may be performed for this condition, why do we have them? It is equally important that we understand why we have poor results, whether the treatment be medical or surgical.

Pathologically, the wall of the bowel in regional enteritis is greatly thickened. Narrowing of the lumen results in various degrees of obstruction, and there are also varying degrees of ulceration of the mucosa, with destruction in places, and hyperplasia. Submucosal lymphatic hyperplasia varies but is present in about 95 per cent of the cases. Characteristically, at operation one always finds large glands, of varying sizes but quite large, in the mesentery. These glands contain giant cells and are discrete, but they do not caseate. Up to date we have been unable to find acid-fast organisms. The condition seems to occur in areas of the bowel in which there is a very rich lymphatic supply.

Before I go further it might be well to present two cases. The first case, presented by Dr. Moore through the courtesy of Dr. Warren Cole, will bring out some points on the symptomatology and the outcome of the disease. Unfortunately, the patient could not be here today.

Dr. Moore, would you kindly read the history of the first patient?

DR. MOORE: The first patient is a 26 year old, white man who prior to 1943 was in good health. In 1943, he first noticed the onset of cramping abdominal pain. At first this pain was confined to the epigastric region, but it soon became predominant in the lower half of the abdomen. Initially the pain occurred one to two times a week, but within a short span of time it occurred daily. Associated with the onset of abdominal pain were frequent watery stools, usually numbering five to six per day. In 1944, the patient began to notice anorexia with frequent attacks of nausea and vomiting. In 1945, x-ray examination at the Illinois Research Hospital revealed a narrow ileum running into a distorted cecum.

At operation on July 8, 1945, it was observed that 4 to 5 feet of the terminal part of the ileum, the cecum, the appendix and the ascending colon were involved. These structures were greatly thickened and fibrosed. Ileotransverse colostomy was performed. The patient's symptoms were improved following operation, but he continued to have some diarrheal stools and abdominal pain. Dietary management helped considerably in giving partial relief of his symptoms.

In September 1952, severe pain developed in the right lower quadrant and a large mass began to appear. Associated with the mass and the pain were frequent attacks of chills with fever.

The mass that was associated with the onset of the pain in September 1952 proved to represent an abscess, which was drained. The resulting sinus drained continuously for a long time. At one time a large amount of blood drained from it.

On February 2, 1953, a second operation was performed. At operation the terminal part of the ileum, the cecum and the ascending colon, which had been bypassed, were badly diseased. The old ileocolonic stoma was functioning; therefore, the terminal part of the ileum, the cecum, the ascending colon and part of the transverse colon were excised. This operation eliminated the major share of the patient's symptoms and he has done well since. He has no abdominal pain, averages two to three somewhat loose stools daily, and has gained 25 pounds in the last nine months.

DR. MAYO: Thanks very much, Dr. Moore.

I think we will consider this patient and the next one together. Hence, I am going to ask Dr. Selfridge, who has kindly brought our next patient here, to present the history of this patient, who was taken care of at Mercy Hospital.

DR. SELFRIDGE: This 49 year old white woman was first seen at Mercy Hospital in May 1948, at which time the chief complaints were of cramping abdominal pain with associated nausea and vomiting, abdominal distention, and the lack of a bowel movement for five days prior to being seen in the emergency room.

There was a past history of bilateral salpingectomy in 1933, cholecystectomy in 1940, and exploratory laparotomy for "adhesive bowel obstructions" in 1943, 1944, 1946 and earlier in 1948.

Physical examination at that time revealed a markedly distended abdomen with hypoactive bowel sounds. The working diagnosis at that time was partial obstruction of the bowel as a result of postoperative adhesions. She was treated conservatively with intestinal decompression and became asymptomatic after approximately a week.

The patient was admitted to the hospital again, in September 1951, with the complaint of recurrent attacks of nausea and vomiting together with abdominal distention. On admission the patient's abdomen was greatly distended, and there were tenderness and rigidity in the right lower and left upper quadrants. Bowel sounds were again diminished. Again intestinal decompression was instituted and exploratory laparotomy was carried out with the release of small-bowel adhesions.

The patient was next seen in November 1951, with evidence of small-bowel obstruction. She responded on this occasion to intestinal decompression alone. Approximately a week later she was again hospitalized with obstruction of the small bowel.

On November 29, 1951, an operation was performed and multiple binding adhesions were found throughout the distal half of the small bowel. In freeing the adhesions, much of the serosa was removed and it was felt that, owing to the previous operations, a resection would be necessary to prevent the possible recurrence of obstructing adhesions. The greater part of the jejunum was found to be normal, with normal serosal covering. In the several feet of small bowel removed, the mucosa appeared microscopically to be considerably thickened in some areas, as did the submucosa. In the muscularis there were numerous polymorphonuclear cells, lymphocytes and mononuclear cells, while erythrocytes were seen extravascularly in many sites.

The microscopic diagnosis was regional ileitis. The patient was again hospitalized, in March 1952, because of cramping abdominal pain, nausea and vomiting for a period of five days prior to admission. There was moderate generalized abdominal distention at that time, but with hyperactive bowel sounds. Right hemicolectomy with the removal of the terminal part of the ileum was carried out on March 5, 1952, and the postoperative course was uneventful. Again, the microscopic findings were similar to those given for the small-bowel obstruction in November 1951.

The patient was seen again, in January 1953, because of small-bowel obstruction. She responded to intestinal decompression alone at this time.

The patient was next seen in March 1953, when she related that after the hemicolectomy she had felt well but still had episodes of diarrhea and abdominal pain. Laparotomy at this time revealed several firm adhesive bands over a dilated sigmoid. The ileocecal anastomosis was found to be normal, and there was no evidence of inflammation suggestive of ileitis.

The patient was then last hospitalized in August 1953 with partial intestinal obstruction which responded to conservative management. Since August 1953, she has remained relatively asymptomatic, has approximately one bowel movement a day, and has more or less maintained her weight of approximately 125 pounds.

DR. MAYO: Thanks very much, Dr. Selfridge. What was the age of your patient?

DR. SELFRIDGE: Forty-nine.

DR. MAYO: And the age of the patient re-

ported on by Dr. Moore was 26. While in 75 per cent of instances regional enteritis occurs between the ages of 11 and 35, it can occur, of course, in patients considerably older than 35. The older the patient the sooner it burns itself out, as a rule, and actually the results from operation are generally better in older persons. The average age of patients with regional enteritis is around 29 years.

About five men are affected to four women. The average duration of symptoms before the disease is diagnosed is less than a year in about a quarter of the cases and a year or more in the remainder.

As indicated in these two cases, abdominal pain is common; in well over 90 per cent of cases it is the main complaint. The pain is attributable in part to the inflammatory condition of the region involved and to peritoneal irritation, and in part to the varying degrees of obstruction which result from narrowing of the lumen.

As far as diarrhea is concerned, the patient may have a regional enteritis and still not have the multiple stools that occur with ulcerative colitis. However, as the inflammatory process begins to involve the colon and to descend from above downward, a greater degree of diarrhea becomes manifest.

Obstruction is the complaint in a little more than 50 per cent of the cases. Fever, strangely enough, is common, and an unaccountable fever, even when not associated with diarrhea or anything else, should perhaps make one think in terms of regional enteritis, because a good many people with this disease have a fever each day. I am sure that we have many, many different degrees of the disease and that perhaps some of them are self-limiting, and self-limiting early. It is analogous to subclinical infantile paralysis. In other words, I believe that regional enteritis clears up in some instances. One might add that it, of course, mimics ulcerative colitis when it affects the colon itself.

There are many possible signs to look for. Nutritional anemia is to be expected from extensive involvement of the intestinal tract. There may be hypochromic anemia, with edema, pellagra and scurvy. Such anemia is present in about 50 per cent of cases. Occult blood can be demonstrated in about 60 per cent of cases. Around 6 to 12 per cent of patients have sufficient blood in the stools to make it noticeable grossly.

Another condition which may appear as the colon becomes involved is arthritis; it is one of the things seen rather frequently in ulcerative colitis.

In the differential diagnosis one thinks in terms of amebic dysentery, tuberculous granuloma, irritable-bowel syndrome, intestinal tumor, carcinoma or carcinoid tumor, lymphoblastoma, sarcoma, myoma, fibroma, actinomycosis and appendicitis.

Medical Treatment

An important factor in medical treatment is that we can rather completely explain the situation to a patient so that it is understandable to him and so that we can get his cooperation. Naturally, the patient must have both mental and physical rest, and a high-carbohydrate, high-protein and low-fat diet. The reason for this is that the intestinal tract which has been subjected to extensive resection, with only a short part of the ileum left, handles carbohydrates well and proteins fairly well, but is not able to handle fats well. We give such patients water-soluble vitamins B and C in high doses, calcium lactate or calcium gluconate, and, for the diarrhea, usually tincture of belladonna, bismuth and kaolin. It is important to avoid narcotics because this is a long-pull disease, and one can easily make an addict of the patient.

There is no definite proof that chemotherapeutic or antibiotic agents are of any value in these cases. We have been warned against the use of corticotropin or cortisone in an inflammatory process in the intestinal tract, because their use may favor bleeding in such cases.

Allergy is something else we must consider when dealing with this disease medically.

Surgical Treatment

As far as surgery is concerned, we have, unfortunately, a very difficult situation, because the recurrence rate is very high—in more than 350 patients followed by Van

Patter over a period of two years, the recurrence rate was 62 per cent. This rate is high regardless of the type of operation done, whether it be resection and end-to-end, end-to-side or side-to-side anastomosis, a side-tracking operation, a side-to-side ileotransverse colostomy, an end-to-side ileotransverse colostomy, or other procedure.

As far as resection is concerned, when one removes the right portion of the colon and the involved part of the ileum, it is important to get well up beyond the apparent site of involvement in the ileum. The operation my colleagues and I have found best, but which is still by no means satisfactory for all patients, is end-to-end ileotransverse colostomy.

In conclusion, I would like simply to say that in 75 per cent of the patients who undergo resection a second time the disease recurs. After a third resection, 89 per cent still have a recurrence. Hence, it is a frightful disease and a patient is lucky if he or she falls within the group of cures.

A high percentage of patients with regional enteritis undergo appendectomy—about a third during the time they have symptoms—and in nearly a fourth of those who undergo appendectomy a fistula develops.

It is hoped that still more minute studies of individual cases will be made for the record. I would say that medical management, except for the justifiably surgical complications, is the treatment of choice, and most patients should be handled medically for a long time before any surgical treatment is attempted.

THE ART OF MEDICINE

MEDICINE, however much it develops, must always remain an "applied science," and one differing from all the rest in that the application is to man himself. Were there no sick persons there would be no need for Medicine, either the Science or the Art. So long as there are, both will be necessary. The application of its Science, to be of value, must be made in such a way that it will produce the maximum of relief to the sick man. This calls for certain qualities in the practicing physician which differ entirely from anything required in the practice of the other applied sciences. Herein lies the Art of Medicine. The need for it is as great today as it ever was, or ever will be, so long as human sickness continues.

SIR ARTHUR HALL
Practitioner, 1941

DIAGNOSTIC CLINIC

Traumatic Heart Diseases, Especially Myocardial Contusion

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The pathology, symptomatology, physical signs and electrocardiographic changes in myocardial contusion are discussed, calling attention to the difficulties encountered in the differential diagnosis from myocardial infarction. Two cases are presented to illustrate not only this, but also the treatment and the usually favorable prognosis.

RAY W. KISSANE

THE historical data, incidence and mode of injury relating to traumatic heart disease have adequately been made a matter of medical record. Therefore, I shall confine my remarks to nonpenetrating cardiac injuries, characterized grossly by myocardial and parietal pericardial contusion and bruising.

A brief review of the pathology will give a good insight into the symptomatology, physical signs, electrocardiographic changes, treatment and prognosis.

Myocardial contusions are characterized by a more or less large number of blood cells in the interspaces between the muscle fibers which often crowd them aside. The hemorrhages are usually subendocardial or subpericardial, but what appears to be a hemorrhage under the pericardium or endocardium is often the apex of a large triangular area of myocardial contusion. There is fragmentation and tearing of the muscle fibers which sometimes involve the papillary muscles. Of great interest and importance are the pathologic changes in the neighborhood of the old hemorrhages. A wall of polymorphonuclear leukocytes, intermingled with granules, surrounds the area, while the muscle fibers have partly lost their transverse striation and are swollen with lumpy or granular protoplasm.

These lesions are usually produced by se-

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

vere injury to the external chest wall, with or without external evidence. The areas of hemorrhage and contusion are usually situated in the muscle, and serial sections are necessary to reveal the pathology. It has also been observed that gross lesions which are not obvious in the fresh specimen will show up well after fixing.

A series of patients was reported previously who had lived for various periods of time following myocardial contusion. In those who had lived more than six months but not more than 18 months, myocardial fibrosis had occurred in 90 per cent and there was still evidence of hemorrhage in 1 per cent. In those who died within a short period of time as the result of cardiac trauma, myocardial hemorrhage, fragmentation and edema were found in each instance. After a few weeks the hemorrhage, with displacement of the muscle fibers, began to be replaced by fibrous tissue, and in the older cases there appeared muscle fiber destruction from anemic necrosis with thinning of the myocardial wall in the area involved.

There is a very close similarity between the cardiac lesion of myocardial contusion and myocardial infarction as the result of coronary artery occlusion. In a recent myocardial lesion the only evidence which would invariably serve to identify myocardial infarction, when there is a question of traumatic etiology, is the finding of a recent occlusion of a coronary artery. The older lesions are extremely difficult to distinguish, and the scars of myocardial contusion and myocardial infarction are frequently identical.

Endocardial lesions are characterized by subendocardial hemorrhage, which varies from a small petechial spot to large areas of bruising and discoloration. The larger hemorrhagic areas have the appearance of hematomas, and occasionally the underlying myocardium is necrotic. These lesions were found in 19 per cent of all the severe and in 50 per cent of the moderate and moderately severe cases of chest trauma. Numerous small tears were found, some also involving the myocardium, and the healing was by scar tissue.

The anatomic structure and relationship of the pericardium predisposes it to nonpenetrating injuries. The observed traumatic injuries were the same, whether produced experimentally in animals or found in humans at necropsy. In those receiving severe to moderate chest trauma, subpericardial hemorrhage occurred in 98 per cent. This was associated with pericardial hemorrhage and quite frequently small pericardial tears.

The subpericardial hemorrhages are usually anterior and near the large arteries, and they also vary in size from small petechiae to large bruised areas. The lesions revealed at necropsy in the patients who lived for at least six months showed areas of subpericardial fibrosis. These uncomplicated lesions of the visceral pericardium have a tendency to heal in a very short period of time. There is, however, always the possibility of a hemopericardium as the result of oozing or hemorrhage from a bruised area or tear. Since this discussion is limited chiefly to myocardial contusion, I will not consider hemorrhages, large and small tears, herniation through the pericardial sac, and adhesive pericarditis.

The consideration of the pathologic lesions of traumatic heart disease explains why the symptoms and physical signs are similar to those produced by other causes. A correct appraisal must be made of the cardiac condition of the patient before, at the time of, and immediately after the trauma. Nevertheless, at the present time more cases of traumatic heart disease are overlooked than are diagnosed by mistake. As the result of traumatic pericarditis, various types of murmurs are occasionally heard. These may be loud or soft, and occasionally they are to and fro. When the pericardium is torn the heart sounds are frequently very peculiar. There may be a clicking sound or a loud or soft murmur with a sharp interruption, or a noise similar to blowing on an empty bottle. All of these murmurs will frequently disappear with a few cardiac contractions or on the change of body position, to re-occur later. A friction rub may replace or be associated with the murmur at any time. The sudden disappearance of the murmur or sound is a signal to be on the lookout for pericardial effusion or hemorrhage with

beginning tamponade which may be present.

The most persistent symptom is severe precordial or substernal pain, which usually develops within a short time after the trauma. This pain, when produced by the anoxemia due to myocardial contusion, is identical with that seen in angina pectoris or myocardial infarction, and when due only to a pericardial lesion, is typical of that seen in pericarditis. The pain may become more severe with inspiration, and there is dyspnea and, occasionally, orthopnea. In traumatic pericarditis the pain persists for a much longer time than that which is caused by the local pericarditis of a myocardial infarction.

The most constant symptom of myocardial contusion is immediate excruciating pain located in the precordial or substernal area and radiating usually to the left shoulder and down the arm, although it may be referred to both shoulders and up the sides of the neck. It is identical with that seen in coronary insufficiency and in myocardial infarction, and after a period of a few weeks the pain may be brought on by exertion, as in angina pectoris.

Occasionally, because of other severe injuries producing either unconsciousness or severe pain, this cardiac pain is not the chief complaint. There have been cases in which the pain will start after a short latent period. However, this is not the rule. We have observed from our necropsy cases that those persons who failed to have pain as a symptom had only small areas of myocardial contusion or traumatic pericarditis. Close questioning of the patient will differentiate the cardiac pain from that caused by fracture and injury to the bony cage.

Approximately 75 per cent of all cases of traumatic heart disease have symptoms immediately, but there may be a delay up to one month. The most common symptoms to develop following a latent period are signs of myocardial weakness, beginning congestive heart failure, and nocturnal paroxysmal dyspnea. Tachycardia and palpitation are common in practically all cases of myocardial contusion. Arrhythmia is frequently seen, and these irregularities present their own characteristic signs and symptoms.

It is not within the scope of this presentation to discuss traumatic cardiac rupture. However, one should always be alert to this possibility and also to the development of cardiac tamponade. In the event this latter possibility presents itself, the diagnosis should be definitely established by tapping the pericardium.

As you can readily see, the differential diagnosis of myocardial contusion and coronary artery occlusion with myocardial infarction is extremely difficult and occasionally impossible. However, this is what one would expect when the underlying pathologic lesions are considered. Caution should always be used in making the diagnosis of myocardial contusion or traumatic heart disease, and the possibility should always be considered that there may have been a coincidental coronary artery occlusion with myocardial infarction following a previous accident. On the other hand, however, there have been entirely too many cases of chest injury with these typical signs and symptoms that have been diagnosed as coronary artery occlusion. It must also be remembered that myocardial contusion can occur in a heart that is already damaged by some other type of heart disease.

The location of the myocardial injury influences the type of cardiac arrhythmia which may result. Premature contractions are by far the most frequent type of irregularity. Auricular fibrillation, flutter, sino-auricular block, nodal rhythm, auriculo-ventricular block, and idioventricular rhythm have all been observed. These disturbances of rhythm have their own characteristic signs, symptoms and electrocardiographic changes. Auricular paroxysmal tachycardia appears less frequently. However, ventricular paroxysmal tachycardia, fibrillation and idioventricular rhythm are the frequent causes of death in the fatal cases. I have produced in dogs experimentally almost every type of arrhythmia. The electrocardiographic changes in the RST components and T waves due to myocardial contusion and pericardial trauma are similar to those seen in myocardial infarction and pericarditis.

The changes may be of the characteristic T-I or T-III type with the corresponding

changes in the unipolar chest and arm leads. However, I have frequently observed that the changes in the conventional leads I and III are not reciprocal. There also may be many changes indicative of myocardial abnormality, such as low voltage, flattening and negativity of the T waves and also elevation or depression of the RST segments. The unipolar leads are also useful in locating the position of the injury and identifying traumatic pericarditis. These electrocardiographic changes are not reciprocal, and when the pericardium only is involved do not show the characteristic QRS changes that are seen in myocardial infarction. There is, however, one striking difference, in that the electrocardiographic changes in both myocardial contusion and traumatic pericarditis return to normal in a much shorter time than those produced by a disease condition. Frequently, alteration in the electrocardiogram does not occur until 24 to 48 hours after the injury, and therefore a series of records should always be taken.

In severe cases of cardiac trauma with myocardial contusion, it is my opinion that oxygen should be administered continuously for the first four to seven days. This not only helps relieve the dyspnea, orthopnea and possible cyanosis, but also appears to control the pain. A narcotic or sedative may, of course, be necessary.

Because quite frequently there is an associated contusion of the lung, one must be on the lookout for the development of pulmonary edema and treat it in the usual manner. It is my experience that pulmonary edema associated with traumatic injury to the chest is due to the pulmonary injury rather than to failure of the heart.

The tachycardia that is almost always present, except in those cases with block, is not controlled by digitalis, but this drug, of course, is of benefit when there are signs of congestive failure or auricular fibrillation with a rapid ventricular rate. The routine administration of digitalis increases the ocurrence of ectopic rhythm and suggests that the area of myocardial damage may have a greater susceptibility for the drug than the normal muscle. However, if auricular fibrillation or other abnormal rhythm is established at the time of injury, an immediate attempt should be made to cause the heart to revert to regular sinus rhythm by the usual method. Spontaneous reversion will occasionally follow a period of rest, but auricular fibrillation has a tendency to recur and to become permanent. It is therefore advisable to administer frequent small doses of quinidine sulfate during the first few days, with the hope of preventing auricular fibrillation, flutter, paroxysmal tachycardia or ventricular fibrillation.

It is my opinion that quinidine is more successful in preventing superventricular arrhythmias, whereas pronestyl is frequently the drug of choice in the ventricular type. The pain of myocardial contusion is not affected by aminophylline, but nitroglycerin and all of the long-acting nitrates appear to lessen the severity but do not cause the discomfort to disappear completely.

The general treatment is similar to that for coronary artery occlusion. However, the period of bed rest is much shorter.

The anticoagulants should never be used, because they not only may produce hemorrhage in other parts of the body, but also may cause oozing or hemorrhage from the traumatic pericarditis and result in hemopericardium with tamponade.

The complications, as well as the shock, which frequently follow this type of injury require special treatment, whether it be medical or surgical.

Above all, great care should be taken during the convalescence to prevent the development of a cardiac neurosis.

About 30 per cent of all patients with serious cardiac injuries come to the hospital unconscious and often apparently morbid. In spite of this, one should not doubt the possibility of survival and should not hesitate to tap the pericardium, not only to confirm the diagnosis, but also to relieve cardiac tamponade until an operation can be performed.

It is advisable that in cases of shock and collapse the heart should not be massaged, but only slightly stimulated, because the areas of injury may be extended, hemorrhage may be increased, or fresh hemorrhage may be pro-

duced. It is true that massage is sometimes successful, but usually the results are only temporary and, in view of the dangers, it is safer to do instrument percussion, electrical stimulation or intracardiac injection.

If there are fractures of the thoracic bony cage, with decrease in the anterior-posterior diameter of the chest, hemorrhage into the posterior mediastinal space with adhesions, or adhesive pericarditis, they will undoubtedly require surgical correction at a later date.

The prognosis in myocardial contusion, fragmentation and hemorrhage depends on the number of lesions and their extent. These contusions have a definite tendency to heal, especially when they involve only one layer of the heart wall. The possibility of cardiac rupture is greatest in the more extensive lesions. Sudden death from cardiac rupture does not always occur, and there are numerous patients who have lived for two or three days, giving an opportunity for surgical intervention.

The prognosis is more serious when the contusions involve the intrinsic nervous mechanism of the heart and produce permanent or immediately fatal arrhythmia.

Isolated internal lacerations may be survived, such as rupture of the septum, especially when the injury does not involve the bundle of His, but the work capacity of the heart is definitely diminished.

The smaller pericardial and subpericardial lesions heal uneventfully, but any extensive pericardial adhesions or obliteration of the pericardial sac may produce myocardial insufficiency and hasten failure. Frequently adhesions result in partial or complete cardiac fixation and permanent disability. Cardiac tamponade frequently causes sudden death or rapid failure. The heart can also be embarrassed by clot formation. Frequently when the wound is small or when the pericardial sac has been obliterated by adhesions, or when there is also a rupture of the pericardial sac allowing the blood to escape into the pleural cavity and defeat tamponade, death is delayed for some time. Slight pericardial injuries heal more readily than those of the endocardium, probably because no blood enters the small tears to cause dissection.

As a general rule, in cases of uncomplicated, mild and moderate cardiac injury, the prognosis for partial or even completely recovery is good. Likewise, injuries that are confined to one cardiac chamber have a more favorable prognosis than those involving several chambers, especially when these are nonperforating.

There are also two other factors making the prognosis more favorable in the juvenile heart: (1) It is smaller in bulk, and (2) children are less likely to be exposed to the bursting types of injury which are usually the most severe.

Anderson summarized the possibilities following myocardial contusion as: complete recovery, reduced cardiac capacity, pain on effort, congestive failure or rupture.

Case Reports

I have two cases which I wish to present to you which will serve to illustrate many of these points.

Case 1—V. H., a 38 year old white man; family and past history are nonessential.

Present illness: At about 10 o'clock on the morning of July 16, 1953, he was struck across the lower anterior chest by a large piece of timber. He had immediate intermittent shooting pain radiating across the chest into the epigastrium and up to the neck. He had no nausea, vomiting or hemoptysis.

Physical examination revealed a well-nourished and well-developed white man with a blood pressure of 118 systolic and 70 diastolic. The pulse was 92 and completely irregular and the respiration rate was 26. The heart sounds were distant, but there were no murmurs, and the lungs were clear. He complained of acute tenderness in the epigastrium on palpation, but there was no muscle rigidity. The rest of the examination was negative.

All laboratory investigation, including the serology, was negative.

A portable chest film revealed a cardiac silhouette to be within normal limits. Electrocardiogram on admission showed a changing auricular pacemaker, nodal and ventricular extrasystoles, runs of ventricular rhythm,

transient, delayed conduction, and left bundle-branch block.

The patient was given 250 mg. of pronestyl every six hours, oxygen and bed rest.

An electrocardiograph on the second day showed nodal and ventricular extrasystoles, transient first and second degree auriculoventricular block, left bundle-branch block, and S-T segment changes. These changes appeared consistent with an anterioseptal myocardial injury.

Later electrocardiograms revealed auriculoventricular dissociation, idioventricular rhythm, runs of auricular and ventricular tachycardia, and other evidence of myocardial change.

The patient was allowed to be ambulatory in 12 days.

A second x-ray revealed a fracture of the fifth and sixth ribs on the right side.

He was discharged from the hospital improved; one month after the accident he had a normal sinus rhythm, and at the present time is considered completely recovered.

This case illustrates the multiple type of irregularities that may present themselves, and also that what may appear to be serious myocardial contusions, involving not only the anterior ventricle walls but also the anterior portion of the septum and probably also the auricular myocardium, can heal in a relatively short period of time.

Case 2—C. W., a 40 year old white man; family and past history are unimportant.

On October 3, 1953, at approximately 6:00 P.M., he was in an auto-tractor accident in which he was thrown from the tractor, striking the pavement. He was rendered unconscious for approximately an hour. He immediately began to cough blood and developed a marked tachycardia.

On admission to the hospital a short time later, physical examination revealed a well-developed, well-nourished man with scalp lacerations and numerous contusions and abrasions over his arms, chest and trunk. He had marked dyspnea and appeared to be in severe pain. There was blood on his tongue and in his mouth.

His blood pressure was 98 systolic, with a diastolic of 70. There was tenderness over the sternum, in the anterior left chest and shoulder. The heart rate was 140, with an occasional irregular beat.

The routine laboratory examination was normal, including serology.

The patient was immediately placed in shock position and given the usual shock therapy; his blood pressure remained low until about 9:30 P.M. He was given penicillin, tetanus antitoxin and supporting therapy.

An electrocardiogram taken at this time showed auricular flutter with two to one block, transient bundle-branch block. An x-ray picture taken at this time showed a simple fracture of the sternum with no apparent compression. The cardiac silhouette was normal in size and in contour.

PURODIGIN®, 0.45 mg., was given every four hours for five doses and then one daily, and the electrocardiogram on October 6, 1953, showed auricular flutter with varied degrees of block, digitalis effect.

The electrocardiogram on October 7, 1953, showed auricular flutter with four to one block and ventricular extrasystoles.

On October 11, 1953, Purodigin was reduced to 0.15 mg. daily and at this time an electrocardiogram showed auricular fibrillation. Quinidine was started, with a dose of 3 gr. every six hours, and on October 13, 1953, the electrocardiogram revealed a normal sinus rhythm with some evidence of myocardial changes and digitalis effect. Purodigin was discontinued and quinidine continued for a short time.

On October 18, 1953, the patient was discharged from the hospital greatly improved and in normal sinus rhythm.

At the present time this patient is still having some pain, which can be attributed to the fracture of the sternum. However, he has developed a substernal pain that spreads across the upper chest to the left shoulder and arm which is produced by effort and also by excitement.

Because of the frequent legal aspects of these cases, I caution you to be precise in your terminology when reading the electrocardiogram and stating your diagnosis.

Surgical Treatment of Aneurysms and Occlusive Disease of the Aorta

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Aneurysms and arteriosclerotic thrombo-obliterative disease of the aorta constitute two of the most common and serious forms of aortic lesions for which treatment has been generally unsatisfactory. Recently, however, a procedure has been developed wherein the lesion is extirpated and function restored by aortic repair or insertion of homografts. The gratifying results obtained by this method of therapy based on an experience with 41 cases suggests it is the most effective approach to the problem.

ANEURYSMS and arteriosclerotic thrombo-obliterative disease of the aorta constitute two of the most common and serious forms of aortic disease. Both conditions are associated with a grave prognosis, producing in most cases disabling symptoms and lethal complications. The former condition results from pressure, rupture and hemorrhage and the latter, from progressive arterial insufficiency, ischemia and gangrene. Until relatively recently, treatment of these lesions has been generally unsatisfactory and, at best, palliative. During the past few years, however, efforts have been directed toward a more effective form of therapy consisting of removal of the lesion and restoration of function either by aortic repair or by insertion of aortic homografts. To be sure, it has not been possible to apply this form of therapy in all cases encountered, but our experience,[4-7] like that of others,[1-3,8,12,16] has convinced us that it is the treatment of choice and can be employed much more frequently than previously realized.

Certain factors—particularly the nature and extent of the lesion and its location—have an important bearing on the successful application of this form of therapy. In general, aneurysms of the aorta are usually of two types, sacciform and fusiform. The former arise most frequently in the thoracic aorta, usually about the arch and great vessels, with syphilis being the underlying disease in most cases. Fusiform aneurysms are most commonly encountered in the abdominal aorta with arteriosclerosis as the most common underlying pathologic process. It has long been recognized that this type of aneurysm most frequently involves the segment of abdominal aorta between the origin of the renal arteries and the bifurcation. Interestingly enough, this is also the segment of aorta most frequently involved in arteriosclerotic thrombo-obliterative disease of the aorta.

The pathologic features of sacciform aneurysms of syphilitic origin include a relatively small neck and a surrounding aortic wall with a leathery consistency suitable for suture. Because of these features, excision can often be done without encroachment upon the aortic lumen.[4,7] It is accomplished by tangential occlusion of the neck of the sac with a clamp, excision of the aneurysm distal to the clamp and lateral arteriorrhaphy to repair the aortic

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

defect, thus preserving continuity of the aorta. Under these circumstances the aorta is not involved in its entire circumference by the pathologic process, and sufficient relatively normal tissue is available for satisfactory repair of the defect. A similar procedure may also be used when the aneurysm involves the major vessels of the aortic arch even though they may be fusiform in type. Because it may be necessary in such cases to sacrifice the involved vessel, it is important to determine beforehand the possible ischemic effects of occlusion of these vessels, particularly of the carotid arteries.

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In the resection of fusiform aneurysms of the aorta the problem is somewhat different, because such lesions usually involve the entire circumference of the aorta for a varying distance. Accordingly, extirpation of these lesions requires excision of a varying segment of the aorta itself along with the aneurysm. Under these circumstances, temporary arrest of the circulation in the aorta distal to the origin of the aneurysm must be done during aneurysmectomy, and the resulting defect in the aorta must be bridged to restore normal circulation. This may be accomplished satisfactorily by means of preserved aortic homografts. Various methods of preservation may be used for this purpose. In our early experience the homografts were preserved in nutrient media at a temperature of 0 to 4° C. More recently, however, in the last 26 cases, we have used freeze-dried aortic homografts and have been impressed with the advantages of this method of preservation.

An important consideration in the performance of this procedure is the potential ischemic effects of the temporary arrest of the circulation on the tissues distal to the point of occlusion, especially in the spinal cord and kidneys. The safe period for occlusion of the aorta at this level has not been accurately determined, but, on the basis of our limited experience[5,7] and that of others[2] with a few cases of aneurysms of the descending thoracic aorta, it has been found possible to occlude the descending aorta for periods up to 58 minutes without evidence of cord or renal damage. Fortunately, most aneurysms requiring this procedure arise in the abdominal aorta below the origin of the renal arteries, and there is usually sufficient margin of aorta between these vessels and the aneurysm to permit application of the occluding clamp without interruption of blood flow to the kidneys. Occlusion at this level for periods averaging about one hour, but in one case as long as two hours, has not been followed by any evidence of ischemic changes in the pelvis or lower extremities. This matter is of little or no importance in thrombo-obliterative disease of the aorta because of the well-established collateral circulation.

Technical considerations of the operative procedure of resection of aneurysms of the aorta with replacement by aortic homografts have been previously presented.[4-7] A left thoracoabdominal approach through the resected bed of the ninth or tenth rib is used for aneurysms involving the lower thoracic and upper abdominal aorta. For aneurysms arising in the abdominal aorta below the origin of the renal arteries an abdominal approach through a midline incision is preferred. The application of this procedure may be illustrated by the following brief case report:

Case 1—W. M., a 73 year old iceman, was admitted to the hospital on September 16, 1953, complaining of pain and a pulsating mass in the abdomen.

Five years previously he was seized, while at work, with a severe abdominal pain which

caused him to fall to the ground. The pain lasted about 30 minutes. Shortly thereafter, the patient detected a pulsating mass in the abdomen which "felt like my heart had fallen into my belly." For two years he had suffered from hemorrhoids and rectal prolapse.

Physical examination revealed that the patient was well nourished and vigorous in appearance. Blood pressure was 140/80. The cardiorespiratory systems were normal. The abdomen was slightly protuberant, and a pulsating mass was visible in midabdomen to the left of the midline. Palpation revealed this mass to be approximately 20 by 12 cm. in size. Its superior margin extended into the epigastrium and beneath the left costal margin, and inferiorly, it extended into the suprapubic region. Pulsations were expansile. A systolic murmur was audible over the mass. Arterial pulses were present in the lower extremities.

Rectal examination disclosed external and internal hemorrhoids and a moderate rectal prolapse. Diagnoses were as follows: (1) aneurysm of the abdominal aorta; (2) hemorrhoids and rectal prolapse.

Results of blood and urine examinations were normal. A roentgenogram of the abdomen showed calcification in the wall of the aneurysm and indicated that from the superior limits of the calcification the aneurysm arose below the renal arteries.

On September 24, 1953, an operation was performed with the patient under general anesthesia. The abdomen was opened through a midline incision centered on the umbilicus. A large fusiform aneurysm of the abdominal aorta was found which extended from the renal arteries distally to include the aortic bifurcation (figure 1). The posterior parietal peritoneum was incised and the ligament of Treitz divided. The aorta was freed just below the renal vessels, and both common iliac arteries were isolated. The occluded inferior mesenteric artery was divided. The aorta above and the iliac arteries below the aneurysm were occluded with vascular clamps, and the aneurysm was excised (figure 2). The defect in the abdominal aorta was bridged with a freeze-dried abdominal aortic homograft. Anastomosis was accomplished with a continuous over-and-over suture of 0000 arterial silk (figure 3). Total time of aortic occlusion was 78 minutes. Upon completion of the aortic transplantation, bilateral lumbar sympathectomy and appendectomy were performed.

Convalescence was uneventful. Within 24 hours pedal pulses were palpable. Ambulation was begun on the second postoperative day, and the patient was discharged in good condition on October 10, 1953.

We have now operated on 26 consecutive cases of aneurysms of the abdominal aorta with the intention of performing this procedure, i.e., resection with replacement by aortic homograft. It was possible to perform the procedure in all but one case. This single exception concerned a patient whose fusiform aneurysm involved virtually the entire abdominal aorta. Under these circumstances aneurysmectomy would have necessitated interruption of all visceral blood supply and, accordingly, was considered impractical.

In this series of 25 cases of aneurysmectomy, the majority of patients were men in the seventh decade, and 4 were over 70 years of age. The aneurysms were arteriosclerotic in origin in all but 1 case in which syphilis was considered the causative factor. The bifurcation was involved, requiring excision and the use of a bifurcation homograft in all but 3 cases. In 2 patients the aneurysm had ruptured, producing severe hemorrhage and shock, and the operations were performed as emergency procedures. Hypertension of moderate to severe degree was present in 7 patients. All 25 patients showed varying degrees of atheromatous changes and roentgenologic evidence of calcification in the aorta.

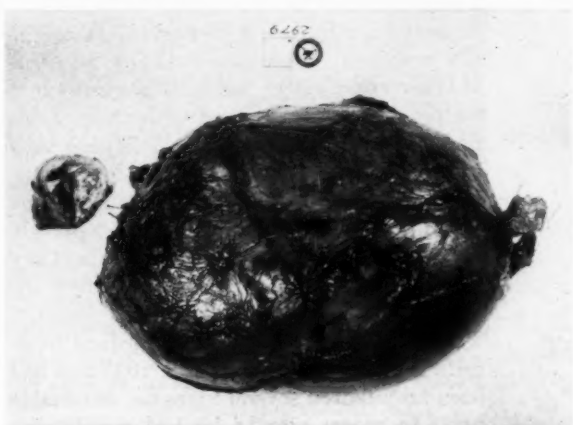
On the basis of experience from this series the impression has been gained that none of the factors mentioned necessarily constitute a contraindication to operation and that major contraindications are concerned with severe impairment of vital functions, involving cardiopulmonary and renal organs.

The operation itself seemed to be well tolerated by all the patients, although 5 died subsequently—2 from severe coronary disease, 2 from renal failure and progressive uremia, and 1 from pulmonary embolism. All of

the other patients have been completely relieved of their symptoms, and their general conditions have shown progressive improvement. Of particular significance is the fact that most of them seemed to have improvement in circulation in the lower extremities.

The operative procedure described for aneurysms of the abdominal aorta may also be employed effectively for thrombo-obliterative disease of the aorta. This condition, which has been termed Leriche's syndrome, or insidious thrombosis of the aortic bifurcation, apparently develops on the basis of arteriosclerotic changes with atheromatous plaques and calcified ulcerated areas in the intima leading to thrombus formation. These changes ultimately produce stenosis and as a result of the superimposed thrombotic process lead to complete occlusion of the lumen. Not infrequently, as observed by Leriche,[13,14] these arteriosclerotic changes begin in the iliac arteries near the bifurcation with progressive thrombus formation propagating upward to occlude completely the aortic lumen. In some instances, this obliterative process progressively extends up as high as and even above the origin of the renal arteries, resulting in death from hypertensive cardiovascular disease and uremia.

The disease is characterized by an insidious and slowly progressive development with symptoms of intermittent claudication, pain, easy fatigability particularly in the hips and legs, and sexual impotency. Physical findings include manifestations of arterial insufficiency in the lower extremities with absence of pulsations and usually a systolic murmur in the



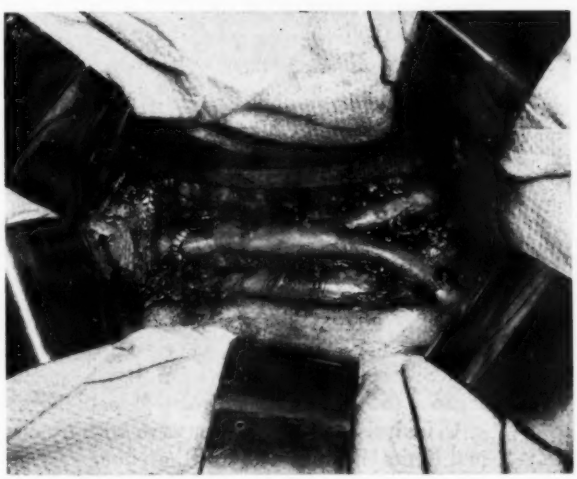


FIGURE 1 *(top)*. Photograph taken during operation in case 1, showing huge aneurysm of abdominal aorta after it had been freed from surrounding structures. Umbilical tapes are shown encircling the aorta above the aneurysm and the common iliac arteries below.

FIGURE 2 *(center)*. Photograph of aneurysm of abdominal aorta after excision in case 1, showing stumps of iliac arteries on left and additional segment of excised aorta on right, and revealing extensive atheromatous changes.

FIGURE 3 *(bottom)*. Photograph made at operation in case 1 after resection of aneurysm of abdominal aorta and completed anastomosis of bifurcation aortic homograft to aorta proximally and iliac arteries distally.

abdomen. The diagnosis may be readily confirmed by aortography (figure 4).

Although the condition is slowly progressive, sometimes over a period of 5 or 10 years, the ultimate prognosis is grave with most patients dying of the complications of the disease. Until relatively recently, treatment has not been satisfactory and, at best, is palliative. It consists essentially of lumbar sympathectomy.[9,10,14,15,17] Thrombo-endarterectomy, designed to remove the diseased intima and restore a normal arterial lumen has yielded better results in some instances.[11,18] In our experience, however, mural changes have usually been so extensive about the bifurcation as to preclude the use of this procedure under these circumstances. For this reason, extirpation of the diseased segment with restoration of continuity by aortic homograft, as originally proposed by Leriche, is believed to provide a more effective therapeutic approach to the problem. The successful application of this procedure is illustrated by the following brief case report:

Case 2—J. M., a 58 year old white man, was admitted to the hospital on October 18, 1953, complaining of abdominal pain, tarry stools, and cramping pain in the lower extremities.

The patient had been under medical treatment for a duodenal ulcer since 1937 and had been hospitalized several times for intractable pain. In recent months he had noted tarry stools on several occasions.

In 1948, cramping pain developed in his left calf when he walked. The pain soon involved the entire left lower extremity, and within the past year the right lower extremity had become similarly affected. The pain was relieved by rest. During the past three years the patient had been impotent.

Physical examination revealed a blood pressure of 190/120. The heart was slightly enlarged to the left. There was moderate epigastric tenderness and a loud systolic murmur was audible in the upper abdomen. The lower extremities showed moderate loss of subcutaneous fat and no pulses were palpable.

Urinalysis and hemogram were within normal limits. Barium study of the upper gastrointestinal tract revealed a duodenal ulcer. Translumbar aortography showed occlusion of the abdominal aorta and common iliac arteries from a point just below the renal arteries (figure 4).

On October 15, 1953, an operation was performed under continuous spinal anesthesia. The peritoneal cavity was entered through a midline incision extending from just below the xiphoid to well below the umbilicus. The preoperative diagnoses of duodenal ulcer and aortic thrombosis were confirmed. A 70 per cent gastric resection and a Billroth I gastroduodenostomy were performed first.

The posterior parietal peritoneum was then incised, the ligament of Treitz divided, and the aorta and iliac arteries mobilized. The occluded inferior mesenteric artery was divided between ligatures. Clamps were applied to the aorta slightly below the renal arteries and to the common iliac arteries, and the aorta and bifurcation were removed (figures 5 and 6).

FIGURE 4. Aortogram in case 2, showing complete occlusion of the abdominal aorta beginning just below the origin of the renal arteries.

FIGURE 5. Photograph taken during operation in case 2, showing mobilized abdominal aorta with umbilical tapes encircling iliac arteries below and aorta above, immediately below overlying left renal vein. Note roughened irregular surface of aorta and dense periaortic fibrosis.

FIGURE 6. Photograph of excised segment of abdominal aorta and bifurcation in case 2, showing complete occlusion of lumen and additional segment of organized thrombus projecting above level of divided aorta and removed from proximal aortic stump.

FIGURE 7. Photograph made at operation in case 2 after resection of obliterated segment of aorta and replacement with aortic homograft.

The proximal aortic lumen was found to be partially occluded by an atheromatous plaque and a soft thrombus. Therefore, a clamp was applied above the renal arteries, the atheroma and thrombus removed, the lumen flushed with saline solution, and a clamp reapplied below the renal arteries; then the clamp above the renal arteries was removed. The lumens of the iliac arteries were occluded by organized thrombi. They were stripped out of the lumen distally to the iliac bifurcations where vigorous back flow was encountered. A reconstituted, freeze-dried homologous aortic Y graft was inserted into the defect, using a continuous over-and-over suture of 0000 arterial silk (figure 7). The total time of aortic occlusion was one hour. Following removal of the clamp, pulsations were detectable in both femoral arteries.

Bilateral lumbar sympathectomy and appendectomy were performed following the completion of the aortic graft.

Within 24 hours after operation bounding pedal pulses were present. Convalescence was uneventful except for a moderate degree of postural hypotension which was relieved by compression bandages applied to the lower extremities.

We have now employed this procedure in 11 cases of arteriosclerotic thrombo-obliterative disease of the aorta. In one of the patients the obliterative process was located in the lower thoracic and upper abdominal aorta, and in the remainder of the patients it in-

volved the terminal portion of the aorta and bifurcation. All of these patients recovered; most of them showed striking improvement in circulation of the lower extremities with return of peripheral pulses and disappearance of previous signs of arterial insufficiency.

In addition to these 36 cases of aneurysms and occlusive disease of the abdominal aorta treated by resection and replacement with aortic homografts, we have used this procedure in 5 cases with involvement of the thoracic aorta. Two of these patients had huge syphilitic aneurysms producing erosion of the vertebrae; two had aneurysms in association with coarctation; and one had arteriosclerotic thrombo-obliterative disease. All of these patients recovered with complete relief of symptoms, and only one showed transient weakness of the lower extremities.

Summary

1. Aneurysms and arteriosclerotic thrombo-obliterative disease of the aorta constitute serious disorders that ultimately produce disabling symptoms and lethal complications for which treatment has been generally unsatisfactory and, at best, palliative. The recent development, however, of a procedure directed toward extirpation of the lesion and restoration of function by aortic repair or insertion of aortic homografts is believed to provide a more effective form of therapy.

2. The successful application of this form of therapy is dependent primarily on the type, extent and location of the lesion. Sacciform aneurysms, for example, which usually involve the thoracic aorta and in which the neck is relatively small and the surrounding aortic wall is suitable for suture, may be excised by tangential occlusion of the neck and lateral aortorrhaphy. Fusiform aneurysms, on the other hand, because of their tendency to involve the entire circumference of the aorta for a varying distance, usually necessitate excision of a segment of the aorta itself with replacement by aortic homograft to restore normal circulation. A similar procedure may also be employed in thrombo-obliterative disease of the aorta.

3. This procedure of excision and replacement with aortic homografts has now been performed in a total of 41 cases, the lesions being aneurysms in 30 and thrombo-obliterative disease of the aorta in 11. There were 5 deaths in this series. All of the other patients showed striking improvement or complete relief of symptoms.

4. Although further experience and longer follow-up observations are required for final evaluation, early gratifying results obtained with this method of therapy provide good reason to believe that it is presently the most effective approach to the problem of aneurysms and thrombo-obliterative disease of the aorta.

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DIAGNOSTIC CLINIC

Diseases of Lymph Nodes

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A woman with Hodgkin's disease of apparently 16 years duration is presented. It is emphasized that a long span of life is possible in patients with lymphoblastomas or chronic leukemias. The major effective tools for therapy include x-ray, nitrogen mustard and triethylene melamine. Each has a place. The patients should be treated whether or not symptoms are present. Normal activity is permissible.

OVID O. MEYER

In this discussion on diseases of lymph nodes, I shall primarily emphasize therapy.

The patient who is here provides a lesson. This lady, who kindly presents herself, is 31 years old. In 1937, a tiny lymph node, about the size of a pea, appeared in the left side of her neck. This node became larger until, in 1947, it was large enough to interfere with her eating. She then had a biopsy performed in Knoxville, Tennessee, where she made her home until she moved to Chicago a few months ago. The biopsy diagnosis was lymphogranuloma, and she started receiving x-ray therapy which was continued off and on until two years ago.

This patient appeared at the clinic this morning because the lymph nodes in the left side of her neck were enlarging, and because she has noted some shortness of breath; her chief complaint actually is headache. She has had these headaches for about two months, largely on the top of her head on the left side.

There has been no history of weight loss. There have been some personal problems which I think we need not go into at this time.

A physical examination, at the clinic where she was seen this morning, showed a slight young lady who has several firm, not hard (and I make a point of that)—*firm, not hard*—nontender nodes, largely in the upper portion of her neck on the left side and some in the left supraclavicular region.

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association in Chicago.

It is also reported that she has inguinal nodes. I emphasize these, not because they are necessarily significant, but because I would like to warn you about biopsy of inguinal lymph nodes. We never choose to take a node from that site if another suitable site exists, for many times we have found that removal of an inguinal node shows only a lymphadenitis, whereas another node will show the true disease.

According to the patient's record, she does not have a palpable spleen, and I have been unable to feel it either. I asked, however, that she be brought out on a cart because I would like to demonstrate a method of palpating the spleen which Dr. Middleton, my chief, described in 1924 in the *American Journal of the Medical Sciences*. It is a very satisfactory method, and although it is not the best method for all cases, you can, more often than with any other method, palpate the spleen when you follow this procedure.

If you will remember that the spleen lies between the eighth and eleventh ribs and mainly posterior to the midaxillary line, only the tip crossing in front, you will recognize that, unless a spleen is grossly enlarged you will not feel it unless you are certain to examine well to the left, laterally. The patient's knees are bent and her arm placed under her back. Thus, you leave both your own hands free rather than push up with your left hand; this enables you to push the spleen forward more effectively than you can by lifting with one hand. With both hands free at the costal margin and well to the left—because only then will you be able to palpate those spleens only slightly enlarged—and with the patient breathing deeply through the mouth, press lightly but reasonably firmly. Because sometimes one is not certain whether it is the spleen or a rigid muscle, it is well to check with percussion at that site.

With the history of dyspnea in this case, you may wonder a bit whether or not mediastinal node enlargement exists. You may well wonder, because 80 per cent of patients with this condition will demonstrate mediastinal node involvement clinically and 100 per cent (or almost 100 per cent) will demonstrate it at necropsy. Actually, as far as I can tell, the chest film in this case demonstrates no significant abnormality. I would say that mediastinal node enlargement is not a part of the picture here.

The combination of mediastinal node enlargement plus pruritus is very suggestive of the diagnosis of lymphogranulomatosis, although it is true that occasionally pruritus may occur with lymphosarcoma and leukemia.

I want to talk a bit about this patient, but I think we may thank her for coming now and let her go.

The patient just presented has a moderate anemia with an erythrocyte count of 3,900,000 and a hemoglobin level of about 12 gm. There is certainly not much anemia, but what there is might in part account for the dyspnea of which she complains.

The lesson I think this patient presents is one which illustrates a thesis of mine. Her disease started in 1937; it is now 1953. We do not know what she had originally, but I would strongly suspect that the node that was biopsied in 1947 had the same histologic character originally as at the time of biopsy. In other words, I think that probably she has had Hodgkin's disease, which she has been told she has, for 16 years. She is up and about and able to do things now, but she does have a lymph node mass, which is not very disturbing.

I have no ready explanation for the headaches. I have not examined her eyegrounds. I don't know whether or not the people who have seen her think she has intracranial disease. It does occur as a complication but not very commonly.

The point I would like to make is that just because a patient has a diagnosis of Hodgkin's disease does not necessarily mean that his life will be short. It is true that the average duration of life is about two and a half years, and some patients will run a very rapid course—less than a year, some even less than six months—but I have seen quite a few patients now who have lived much longer.

How can you decide what is going to happen to a patient with this disease? Incidentally, to digress for a moment, I never use

the term Hodgkin's disease at the bedside any more. I choose, rather, lymphogranulomatosis. I do so because our patients now know a great deal about Hodgkin's disease. For example, before Christmas last year we had a boy in the hospital, who had read the articles in the newspapers, which all of you doubtless read, about the woman in California who had Hodgkin's disease and was going to have her baby just before Christmas and then right after she had her baby she was going to die. This boy said, "Well, if this is the sort of deal we are up against, what's the use of my trying to get well?" Many patients know someone in their home town who had Hodgkin's disease and died. It is bad for morale, and I try not to state the diagnosis, because we all know that there are different types of the disease. There is the paragranuloma, the granuloma and the Hodgkin's sarcoma. In a statistical series, admittedly, the patient with Hodgkin's sarcoma has a poorer prognosis than the one with paragranuloma or granuloma, but it doesn't always hold, and I have had patients with sarcoma live for many years while patients with granuloma have run a very rapid course.

In the individual patient, in my experience, the histologic picture is not of significant help in prognosis. What do I depend on? Well, I can't rely on anything very much. Some people say that the outlook with mediastinal node enlargement is bad; others have stated that the prognosis with splenomegaly is poor; still others believe that the prognosis is worse in the children than in adults. Yet I can show you a boy who is working on a newspaper in Northern Wisconsin who came to us at the age of 7 in 1937 and received roentgen therapy in 1937, 1938 and 1939. He had the therapy because, when he came to us, he had fever, anemia, mediastinal node enlargement, cervical node involvement, and an enlarged spleen. He has none of those symptoms now and has had none since 1939. He has had no therapy since 1939. He graduated from the University of Wisconsin at 22, a year ago last June, and is actively at work. There is no evidence of his having Hodgkin's disease at this time.

Another patient was a woman with Hodgkin's disease whom we followed for 26 years; she died of a cerebral hemorrhage. During that time she raised a family of five children, was very active, and even worked in a war plant for a while. So one can't be completely pessimistic in every case.

I think that the best indication of how a patient with Hodgkin's disease will do is his response to therapy; a poor response has more significance than a good response. By that I mean, if we give roentgen treatment to a patient with Hodgkin's disease and that patient responds well, that is fine and it is favorable, but it does not provide an accurate guide to how long the patient will live. But if the patient doesn't respond well, that is very ominous, in my opinion; usually that patient's life span will be less than two years.

What about therapy for the lymph node diseases? In recent years several new types of therapy have been developed for Hodgkin's disease and lymphosarcoma as well as for the leukemias; I include the leukemias here because the lymph nodes are usually involved in leukemia.

Roentgen therapy was first employed about 1903 for the lymph node diseases, by Senn, Pusey, Coley, Heinle and many others. Now, 50 years later, we still have no better therapy for Hodgkin's disease. In fact, roentgen therapy for the usual case is the best treatment available, and by the usual case, I mean the patient who has symptoms of the disease and for the patient who has some localization of the disease. For the average patient who has some localization of the disease, with lymph node, spleen, liver or other tissue involvement that can be treated locally, roentgen therapy still is superior to anything that we have.

Radioactive phosphorus does exactly what roentgen therapy does and has no particular advantage, except that one may eliminate the x-ray sickness that sometimes occurs.

Nitrogen mustard, a drug which has been found effective in the treatment of Hodgkin's disease, has been of significant help. It is not the therapy of first choice for the usual case. However, for the patient who has marked

systemic disease without much localization, high fever, sweats, anemia and weight loss, nitrogen mustard may be most effective and the drug of choice. Nitrogen mustard has two disadvantages: It must be given intravenously in a strictly prescribed manner, and in most patients it produces nausea. We ordinarily give 0.1 mg. per kilogram of body weight intravenously, in a dilute solution. We have the intravenous set running and add the nitrogen mustard to the solution. It must be made up fresh. It is a white powder to which must be added water or saline solution and the mixture given shortly thereafter, for the material rapidly loses potency. We ordinarily give a dose every night or every other night for four to six doses. It has a rapid effect. It is a significant depressant of the bone marrow and hence one must watch the leukocyte count in particular. The maximum depressant effect on the bone marrow occurs in about 10 to 20 days; hence we never repeat the course until after six weeks have passed, and then it is usually permissible.

Results with nitrogen mustard have been good in most cases. In patients who have become resistant to roentgen therapy, this drug also has a place, and it may produce remissions when roentgen therapy no longer is effective. It has been stated by Watkins and others that after one or two courses of this therapy, the patient may once more become sensitive to roentgen therapy.

Triethylenemelamine is similar to nitrogen mustard. Both these drugs act because of the ethylenimonium derivatives into which they are broken down; they operate to inhibit mitoses and interfere with the cellular enzyme systems. There are also other important effects. Triethylenemelamine can be given by mouth. The dose is a 5 mg. tablet, and it is my usual custom now (this is not absolutely fixed) to give one 5 mg. tablet every other day for three doses and no more. This drug is extremely potent; it has a marked depressant effect on the bone marrow, and one must be cautious. We follow the leukocyte count. After the three doses, we wait two or three weeks, and then give a dose varying from 2.5 to 10 mg. once a week. I like this material very much; it works very satisfactorily and is effective in many instances. If it is given by mouth, it does not often produce nausea or vomiting, and it can be continued week after week for as long as six months, with a leukocyte count before each dose is given. This drug is about to be released on the market; it has been approved by the Food and Drug Administration.

To digress a bit, phenylbutazone has been stated to be effective in Hodgkin's disease. We have had no experience with it. There is a new drug, triethylene phosphoramide, which acts in the same way as triethylenemelamine and nitrogen mustard. It has only a single advantage, however, as far as I can tell; that is, it can be given intramuscularly. It has been stated to be more effective than anything else in the treatment of melanosarcoma, but we have only treated one case with it, and that unsuccessfully.

Cortisone and ACTH have been used in the treatment of Hodgkin's disease and were found to be unsatisfactory.

Occasionally, a patient with lymphoma or leukemia develops a hemolytic anemia, as evidenced by a rapid fall in the blood cell count after transfusions, an increase in reticulocyte count, a positive Coombs' test and increased urobilinogen in the feces. When this happens, one may do one of two things: First, we usually give cortisone. Occasionally, we can control the hemolytic process very satisfactorily, but more often there is failure, and splenectomy is then indicated. Surgery does have a place in the treatment of Hodgkin's disease. On occasion we have failed to observe cessation of the hemolysis after splenectomy has been done, and then the exhibition of the cortisone has been attended by better control and better maintenance of the hemoglobin and red cell levels.

What about surgery in the treatment of Hodgkin's disease per se? From 1914 to 1916, Bunting and Yates advised wide excision of lymph nodes with the hope of cure. I think that would be logical provided you find a patient in whom the disease is sharply localized. I have never seen a patient with Hodgkin's disease (over 300 patients) in whom I

thought the disease was sufficiently localized to warrant radical excision of the lymph nodes. In lymphosarcoma we are dealing with quite a different problem and there radical excision of the localized disease, before it metastasizes to other sites, is indicated, and in my judgment roentgen therapy should follow.

For chronic lymphocytic leukemia, Rundell and Barton think that triethylenemelamine may be the treatment of choice. It has not been my experience that it is as effective as roentgen therapy. I still think that has first place, and we ordinarily treat the lymph nodes, spleen and other sites of involvement with roentgen therapy. In the case of leukemias, we are usually less interested in the leukocyte count than we are in the level of hemoglobin and red cells, because the leukocyte count itself is relatively unimportant in the treatment of any type of leukemia. You should be interested primarily in whether or not the patient has symptoms. I wish, in fact, to emphasize this point: In the treatment and management of patients with leukemia or lymph node diseases, such as Hodgkin's disease or lymphosarcoma, the treatment should be administered when the patient has symptoms; when the patient has no symptoms, treatment is not necessary.

Aside from the so-called specific therapy for these conditions, there are other factors to consider. With regard to nutrition, a high caloric, well-rounded diet, with adequate vitamins, is important. We administer iron, not liver, because liver and vitamin B_{12} usually have no efficacy in the treatment of such anemias.

It is important to direct attention to the mental status of these individuals. They are nice patients. If you have a clinic of this sort and take care of these patients, they usually become friends of yours. They become friends because you see them every few weeks or months for years on end, and they don't all die of leukemia, Hodgkin's disease or lymphosarcoma. Years later, they may die of coronary occlusion, cerebral accidents, or something else, so you need not be a pessimist when an ominous diagnosis is made. Some of my friends who are sympathetic think that it must be very discouraging to run a clinic of this sort. It isn't discouraging; it is very interesting, because although these patients do have complications, you can do something for them, and you can keep them reasonably happy and active for long periods. When they have no symptoms, there is no reason why they cannot continue to carry on a normally active life, and I strongly encourage them to do so, whether they have leukemia, Hodgkin's disease or lymphosarcoma.

In the lymphosarcoma group, the reticulum cell sarcoma, by and large, is most resistant to roentgen therapy. The lymphoid cell lymphosarcoma is sensitive to roentgen therapy, and the so-called follicular lymphoblastoma, which most of us believe is a form of lymphosarcoma, is more sensitive to roentgen therapy than any other tumor with which I am familiar.

Nitrogen mustard and triethylenemelamine are also effective in treating lymphocytic leukemia. These drugs are perhaps more effective in Hodgkin's disease or lymphosarcoma than in lymphocytic leukemia, but there is overlapping and it is not a point of great importance.

For granulocytic leukemias—chronic myelocytic and chronic myelogenous—we now use the term granulocytic leukemia. Roentgen therapy is the treatment of choice. We still use Fowler's solution; it was suggested in Osler's first edition. It is used according to the specific schedule outlined by Forkner and Wu in 1930, when they revived it; the dosage is given in terms of drops (they are not the same as minims): 3 drops three times a day, increasing 3 drops a day to about 6 or 7, and then 1 drop a day up to tolerance or to the desired effect. In some instances, very good results will be achieved. I have seen it effective in the rare circumstances where roentgen therapy failed.

Urethane, the anesthetic ethyl carbamate, is occasionally effective; again, the hazard of leukopenia of excessive degree in some instances exists.

Cortisone and ACTH may be tried when other things fail. In general they are not very effective.

There is no cure for acute leukemia. A new drug now being employed, 6-mercaptopurin, which differs from the antifolic acid drugs, is sometimes effective in inducing remissions when the antifolic acid drugs or cortisone are ineffective. In our experience, we had much better results with combined cortisone and antifolic acid therapy than with either alone. Some years ago I used to teach that it didn't matter what type of leukemia a patient had, because we didn't know the cause, the course was similar and the outcome was the same. That is no longer the case. We must, so far as possible, establish the type of acute leukemia present, because now we know that patients with acute lymphoblastic leukemia respond best to the antifolic acid drugs. Those with monocytic leukemia, on the other hand, rarely respond to anything, and patients with granulocytic leukemia and probably also monocytic leukemia, on occasion, are likely to have a more rapid downgrade course with the use of cortisone or ACTH.

I would like to conclude by being repetitious. May I urge that in the treatment of patients with Hodgkin's disease, lymphosarcoma and the chronic leukemias, you not be inevitably pessimistic; these patients may live for many years, and they can be happy and comfortable if we do not alarm them, if we do not make them too conscious of the fact that they have a malignant disease. And finally, may I urge again that you treat these patients—when they have symptoms—with the agents available, and there are more such agents now than there were a few years ago; when they have no symptoms, allow them to go their usual way.

NEW BOOKS RECEIVED

New books received are acknowledged each month. As space permits, books of principal interest to our readers will be reviewed more extensively. Reviews and additional listings will be found in this issue starting on page A-72.

Nutritional Studies in Adolescent Girls and Their Relation to Tuberculosis. By Joseph A. Johnston, M.D., Pediatrician-in-Chief, Henry Ford Hospital, Detroit, Michigan. 330 pages with 194 illustrations, 184 charts. 1953, Charles C Thomas, Springfield, Illinois. $7.50.

The Physics of Radiation Therapy. By Harold Elford Johns, Ph.D., Professor of Physics, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 298 pages with 154 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $8.50.

Films in Psychiatry, Psychology and Mental Health. By Adolf Nichtenhauser, M.D., Marie L. Coleman, David S. Ruhe, M.D., Medical Audio-Visual Institute of the Association of American Medical Colleges. 269 pages. 1953, Health Education Council, New York. $6.00.

Lesions of the Lumbar Intervertebral Disc: With Special Reference to Rupture of the Annulus Fibrosus with Herniation of the Nucleus Pulposus. By R. Glen Spurling, M.D., Clinical Professor of Surgery (Neurosurgery), University of Louisville School of Medicine, Louisville, Kentucky. 148 pages with 77 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $4.75.

Hyperparathyroidism. By B. Marden Black, M.D., Associate Professor of Surgery, Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota, Rochester, Minnesota. 119 pages, illustrated. 1953, Charles C Thomas, Springfield, Illinois. $3.75.

Physiological Cardiology. By Arthur Ruskin, M.D., Associate Professor of Internal Medicine, University of Texas Medical Branch, Galveston. 318 pages with 12 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $8.00.

Autopsy Diagnosis of Congenitally Malformed Hearts. By Maurice Lev, M.D., Pathologist and Chief of Research Laboratories, Mount Sinai Hospital of Miami, Miami Beach. 195 pages with 192 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $7.50.

The Principles of Thoracic Anaesthesia; Past and Present. By William W. Mushin, M.R.C.S., Director of Anaesthetics, Welsh National School of Medicine, and L. Rendell-Baker, M.R.C.S., Consultant Anaesthetist, United Cardiff Hospitals and Welsh Regional Hospital Board, Wales, England. 172 pages, 217 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $9.50.

Treatment of Toxic Goiter With Radioactive Iodine. By Lindon Seed, M.D., Director, Isotope Laboratory, Grant Hospital, Chicago, and Theodore Fields, M.S., Assistant Director, Radioisotope Laboratory, Hines Hospital, Hines, Illinois. 116 pages, illustrated. 1953, Charles C Thomas, Springfield, Illinois. $3.75.

The Recognition and Treatment of Anxiety States

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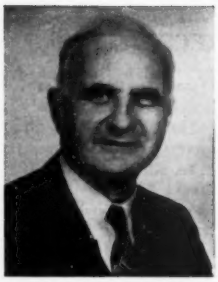
Anxiety states are among the most prevalent conditions with which physicians everywhere have to deal. They are encountered in the form of (1) anxiety neuroses, (2) anxiety states with severe somatization and (3) anxiety states occasioned by deficits in the functioning of the organism, such as coronary disease, disfigurement or cancer. Many anxiety states can be adequately treated by the physician in general practice, using modified psychotherapeutic methods as well as such adjuvants as drugs and physiotherapy.



D. EWEN CAMERON

ANXIETY states are among the most prevalent conditions with which physicians everywhere have to deal. In order to gain a little perspective toward the problem, let us briefly review the natural history of illness. During the Middle Ages, populations began to increase in the small walled cities, long before modern ideas of sanitation, or even ordinary ideas of sanitation, and of food handling were available; hence, there occurred a great upsurge of conditions of an infectious nature, i.e., plague and many other such illnesses.

Later came a period when the cities rose in still greater numbers and with still larger populations, and when the individual no longer produced his own food. This was the period of adulterated food, deficient food—the polished rice period—and the like; consequently, the deficiency diseases became more significant.

Now we live in a time of great changes, of tremendous social changes, and, in consequence, this is a period of maximum stress. It is a period during which there is often a question of how much can be done within an hour or within a day; there is a question of how many contacts one can maintain, how many people one can meet and deal with within a given period of time. This is far different from the lives of our grandparents, when the number of people with whom they had to deal was quite limited. This is a

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Presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

period, then, of the great stress disturbances, an age when tension and anxiety seem to be rising to maximum frequencies.

I want to point out that anxiety states are to be found in three principal areas. First of all, there are the anxiety neuroses, which include anxiety, tensional states and general anxious-mindedness.

Second are anxiety states with severe somatization, where the presenting complaint is often a disturbance associated with the stomach, the heart, breathing, or the skin. This is an area where I think the psychiatrist most frequently meets his colleagues in other fields of medicine and has to deal jointly with them in the management of these cases. I will elaborate this in detail shortly.

The third and last great category of anxiety states comprises those occasioned by deficits, and I have listed these occasions in alliterative sequence simply to demonstrate that they are so numerous that you can easily pick out a series of alliterations.

Coronary	Disfigurement
Cancer	Disability
Castration	Deprivation
Convulsion	Death

In this third group are anxieties caused by worry about coronary conditions, worry about cancer, worry about castration (I use the word "castration" with reference to women also), worry about convulsions, and about disfigurement; and a tremendous cause of anxiety is disability, including that, for instance, which causes deep anxiety in a 56 year old teacher who is aware of a growing memory deficit as aging takes place prematurely; and deprivation, which is described extraordinarily well in Bowlby's descriptions of maternal deprivation in childhood and its enormously destructive effects on the growing personality.

The recognition of anxiety requires a certain number of, shall we say, alterations in our general attitude. The difficulty all of us in medicine have encountered in dealing with nervous and mental diseases is that we approach them with a background of training which not only is primarily somatic but also contains a number of other premises of which we have to rid ourselves if we are to be able to understand behavioral problems adequately. First, we must realize that the human organism is not a mind *and* a body but that it *is* an organism and that the individual reacts totally. If you frighten someone, he will be frightened right down to the soles of his feet, and the soles of his feet may well sweat. Every part of the organism may participate in the anxiety response; quite frequently one part or another will respond markedly for a variety of reasons, and this response may be the presenting symptom. Unless you are quite alert and aware of this fact, you may not see that behind the complaint of pain in the back of the neck, behind the complaint of pain in the epigastrium, behind the complaint of a tremulous feeling inside the arms, stands the general anxious-mindedness of the individual. Therefore, this is the first general premise that I would like to put before you: When you begin to think of behavioral problems and of anxiety, you must appreciate the fact that the anxiety response is total.

The next point is another with which doctors, as a rule, are not particularly concerned, that is, that anxiety is frowned on by society and, therefore, is often hidden by the patient from himself and from others. For instance, I talked a few minutes ago to a little girl suffering from an anxiety state, who had been brought to me as a possible case to be demonstrated to you, and I asked her if she were scared. That was the wrong kind of question, because she drew herself up and said, "No, I'm not scared." I said then, "Are you apt to be tense and worried about things?" And she said, "Yes, indeed." To ask some people if they are scared is often the equivalent of asking them if they are yellow or cowardly or something of that kind. One, therefore, has to pick one's phrases rather carefully in taking the history from a patient one suspects is suffering from an anxiety state.

Anxiety is contagious and especially so in the case of growing children. This is a matter of great concern when dealing with an anxiety-neurotic woman, and the effects on the children may be considerable.

The next point is that anxiety, if long con-

tinued or if acute, is damaging, and its effects may indeed be permanent. That would seem to be an extremely serious state of affairs, but it is true. The studies being made of children deprived of parental relationships during periods of from six months to five years indicate very clearly that permanent and lasting damage may be done, and that nothing now at our command will alleviate those symptoms.

With regard to the differential diagnosis, may I make this basic point: Careful history taking will nearly always differentiate anxiety symptoms from others.

History Taking

In taking a history, I feel that there are four or five cardinal areas in which one has to make specially careful inquiries. First is the patient's statement, and I have already indicated that it is important to choose your phrasing of questions. Sometimes people will say frankly that they are anxious, that they are worried; more often one has to go around it somewhat and say, "Are you tense?" Some people, oddly enough, do not have that concept in their minds. You can get around it still further by saying, "Do you have any difficulty in relaxing?"

The next important question is: To what extent do the patient's symptoms cause limitation? Some major limitations are: Deeply anxious people cannot readily go into crowds. Deeply anxious people do not want to be alone, as a rule, although you will find a few exceptions; they want to be with one person well known to them; they want to remain in well-known and familiar situations. Deeply anxious people can't stand tension, difficulties and struggle around them; they become very upset by rows and will try to do everything possible to avoid them. Deeply anxious people cannot stand stress for long; they become fatigued very easily.

The third general question concerns the patient's sleep and appetite. Sometimes one finds in textbooks the statement that people who are anxious find it hard to get to sleep, or, having gone to sleep, waken and cannot fall asleep again. All those things are true. There is no possibility of differentiating between, shall I say, depression and anxiety on the basis of whether a man goes to sleep easily and wakes up or cannot get to sleep easily. The general effectiveness of the individual suffering from an anxiety state goes down; he makes more errors; he cannot concentrate; he cannot remember as well; he cannot make decisions.

The fourth general question, and a most important one, is to determine whether or not there is a relationship between the intensification of symptoms and any incident in the surroundings. Here one meets considerable difficulties because patients very often invert things. For instance, I have a patient now who has a lot of intermittent pain in the side of her head. She says that the pain prevents her going out and prevents her meeting people. Actually, careful tape recordings of her statements, played back and studied with her so that she can hear them again and again, show that the situation is really inverted. The pains in her head come on when she gets into crowds; they are a localized symptom of tension in the cerebral musculature engendered by her anxiety.

Differentiation is expedited by knowledge of the anxiety response and by the diagnostic use of drugs. We use SODIUM AMYTAL® intravenously, about 3.75 gr.; this very often will serve to show whether the patient's complaints are based primarily on anxiety or whether a somatic condition is present as well. It is these "as well" cases which are so difficult to unscramble. It is true that the sedative effect will reduce the intensity of a complaint caused by gastritis or a gastric ulcer, but it will not abolish it altogether, whereas it will abolish anxiety complaints.

Treatment

Treatment of anxiety states should be "organismal," the patterns of treatment varying with the kind of anxiety state. (After I had written the word "organismal," I thought perhaps it would have been better to use a newly emerging word that seems likely to have great significance in medicine—the word "comprehensive.") In other words, the treatment ap-

proach to the anxiety-neurotic patient should be at all possible levels.

An anxiety neurosis will probably not be cured by drugs alone. That may seem an odd statement from a psychiatrist, but I make it for this reason: Quite often attempts are made to clear up an anxiety neurosis with drugs, especially drugs of a sedative nature. Psychiatrists ordinarily do use drugs in treating these cases, but they use them only to a limited extent and in conjunction with psychotherapy. One may use a drug as what one might term a sedative bandage, to prevent the most disturbing of the symptoms from appearing while proceeding with psychotherapy.

Another useful image in thinking about this is that we have great need of chemical agents in psychiatry which will allow us, as it were, to turn off the water main and to get at the business of repairing the broken pipe further down. In other words, we need to turn off the anxiety so that we can get at underlying factors and start repairing them.

It is unlikely that you would succeed (and it may be dangerous to try) in clearing up anxiety caused by severe somatization by means of psychotherapy alone. This statement is perhaps a little defensive on my part, because some of my colleagues in other fields have said to me, "Look, if you think that this man's condition is primarily an anxiety neurosis which has resulted either in his having an ulcer or in an ulcer continuing, do you mean you would put him down on the psychotherapeutic couch and go to it?" The answer obviously is, "No, I wouldn't." Here is an example wherein you would treat the patient with comprehensive medicine; in other words, you would ask your colleagues to work with you in attempting to control the situation. If the patient needs medical care, that is what he would get; if he needs surgical intervention, yes; but if he has an anxiety neurosis, it is a little unlikely that his stomach condition will clear up without all three physicians working on him at the same time.

I was rather interested the other day when one of my surgeon colleagues sent me a patient, a very hostile, anxious woman, who had very clear-cut evidence of ulcer formation. I said, "Well, hadn't you better get to work on the ulcer and clear that up and then I will work on her anxiety and hostility later?"

He said, "No, I won't. If I do clear up the ulcer now, her condition will be back again very soon, as bad as ever. You have to try to do your job first." Well, that was quite an advanced viewpoint; I welcomed it. The patient didn't and she went away. You have to modify your progressiveness to suit the climate of opinion existing in the patient's mind.

Psychotherapeutic methods, adequate for many cases, though not for all, can be learned and used by any physician, and I want to touch on some of these. Here are the basic principles for such methods:

The first principle is listening. I have included it because the public and even most doctors think of a doctor as someone who performs an active role. The doctor, in the mind of the patient and in his own mind, is the fellow who does something to you, the fellow who sticks a knife into you or puts a pill down your throat, or, if you happen to be of the right sex, extracts something from you; in other words, he is the doer. In the field of psychotherapy, this is not true; the doctor is no longer the active person, but the collaborator who sits and listens. It is sometimes extremely difficult for doctors to do that, but if you can listen and let the patient unfold, this will do him more good than any early intervention on your part.

As a concrete image of that, may I remind you of something that you may have had or been given when you were quite small. When you were little boys and girls, at Christmastime, you possibly received presents of what were called Japanese flowers, little rolled-up pieces of paper which, if put into warm water, would slowly expand into long tendrils of things that looked like plants and flowers. If we took a pin and tried to pick them apart, as most of us did, we know what we got, namely, pieces of paper. That is what I have in mind here, that if you can create the proper permissive, supportive, reassuring attitude and listen to the patient, the patient will unfold and his troubles will be greatly ameliorated.

Doctors, then, may have difficulty in seeing

the value of helping the patient identify his problems. I was talking to a group of Army physicians about this the other day, and they said, "After you have identified the problem what do you do?"

I said, "Fortunately, you don't have to do very much because the organism is equipped with homeostatic mechanisms which act at the level of behavior as well as at any other level, and once the patient can understand what's wrong he can very often find the way out. Hence, you have the next point, which is to use advice sparingly."

Another method of dealing with anxiety states is the use of relaxing drugs, of which barbiturates are undoubtedly among the best. Recently, however, we have become exceedingly interested in a number of adrenolytic drugs, one of which looks extremely hopeful. This is a drug called Largactil. This drug has a depressant effect on the central nervous system, but primarily it acts to reduce the activity of the sympathetic division of the autonomic nervous system, and we have had rather good fortune with it in dealing with anxiety states. There are, however, some side effects which still have to be worked out and reported. You will appreciate the fact, I hope, that I still maintain what I stated earlier, that this is just a way of switching off the anxiety or decreasing it while you get at the underlying factors and causes. It would be fatal to think that you could deal with an anxiety state only by these means. These are adjuvants; they are not the heavy artillery.

Next is the use of physiotherapy. This has not, to my mind, been used sufficiently. Physiotherapy, in the form of muscle exercises, of general diathermy and of massage, is exceedingly useful in reducing anxiety and tension.

The last treatment principle I want to mention is the matter of replanning the individual's work and his play. This is often an exceedingly important part of the therapy of the anxiety-neurotic patient. We see, as you do (we in the medical profession are apt to be bad examples), people who drive and drive and drive and never relax, people who seek, as it were, salvation through work; if they aren't working they feel mildly guilty and fiddle around until they find something to do. Sooner or later, such people have difficulties, and it is part of the replanning of the anxiety-neurotic's future to find alternative ways of relaxation for them. In general, we find that large-muscle recreations and those recreations which he may carry on at his own speed and not at an opponent's and which are not competitive are best. For instance, if the patient can play golf without trying to beat someone, if he can swim or go horseback riding, that is fine; or if he wants to climb up a mountain to collect wildflowers, that is not bad either. It is sometimes rather difficult to convey to people that the kind of recreation they should follow should be an integral part of their pattern of living.

In replanning work you can readily see that there are quite a number of kinds of work which get people into trouble. For instance, there are deadline occupations, such as those in which people have to bring out advertising copy against a deadline or write columns for newspapers and get one out each day on time; such work is pretty disturbing for a person who is an anxious, intense and high-speed individual. People who have jobs in which there is a great deal of uncertainty and insecurity should be encouraged to shift, if they can. You will find, rather interestingly, that quite a number of people suffering from anxiety states tend to gravitate knowingly to jobs which have maximal security and minimal responsibility.

There are certain guides in selecting people for psychotherapy: Are they predisposed individuals? Have they been insecure since childhood? As children, have they had long periods of bed-wetting or of nail-biting? Were they shy and lonely? Were they poor mixers? If people of that type come to you with anxiety neuroses, they will be very hard to treat and you may have to refer them for psychotherapy. However, there are a lot of people who have acute breakdowns and acute anxiety states—anxiety states occasioned by the sudden appearance of deficits—and those people, I am certain, can be treated by men in any of the fields of medicine and do not necessarily have to be seen by a psychiatrist.

CASE REPORT

Erythema Nodosum Treated with Cortisone and Complicated by Tuberculous Adenitis

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A case of erythema nodosum is described in which the patient was successfully treated with cortisone. There has been no relapse five months after cessation of therapy. A complication, suppuration of a tuberculous lymph node, was controlled by the use of roentgen therapy.

ONLY three cases of erythema nodosum treated with cortisone are described in the medical literature. In the case of Albright and Kuffel[1] influenza was apparently the etiologic factor. The patient was treated with cortisone and during the first two weeks received 3200 mg. After a relapse, an additional dose of 1400 mg., given during the next week, was sufficient to prevent a further recurrence. A recent communication from Albright[2] stated that the patient has not had a recurrence of erythema nodosum.

The second case, described by Farber and Mendelbaum,[3] was that of a pregnant woman who had had rheumatic fever and developed nodular erythema. This patient was treated for three weeks with various antibiotics, but without success. After only 700 mg. of cortisone, erythema cleared up and there have been no recurrences to date.[4]

The third case, reported by Ureles and Kalmensohn,[5] was that of a patient with a marked allergic background who was treated by cortisone with similar success. The total dose of the drug administered during five weeks of therapy was 3000 mg. There were no recurrences during a two month follow-up period.

In the following case, latent tuberculosis of a supraclavicular node was apparently the cause of erythema nodosum. Cortisone was the only drug that effected a remission which seems to be permanent. The fact that cortisone undoubtedly precipitated adenitis makes this case even more interesting.

Case Report

P. F., a 35 year old Filipino, came to my office on April 1, 1953, complaining of pain and swelling of both ankles and calves with multiple, warm, very tender, red nodules over both lower legs. He claimed that he had a low grade fever (99 to 100° F.) on several occasions and recently had infrequent nocturnal hidrosis. The onset of the symptoms could be traced back three weeks when he began to feel pain in both leg muscles, especially in both gastrocnemii. A day or two later he no-

ticed the appearance of red, tender blotches which finally covered his legs. He consulted a physician who, suspecting peripheral vascular disease, prescribed vasodilating drugs. There was no relief with this therapy. In addition, by that time he had developed pitting edema of the ankles and his legs were hurting so much that he began to limp.

The patient had lived in the Philippine Islands most of his life and was in Korea in the fall of 1952. He had had an appendectomy in 1939 and a tonsillectomy in 1940. His weight had always averaged about 185 pounds. He was quite athletic as a youth and played much basketball.

Physical examination—The patient walked with difficulty, wincing from pain. He appeared well nourished and weighed 180 pounds. Both lower legs were swollen around the ankles and covered by numerous red, warm blotches, which were exquisitely tender to touch. Some of these nodules in the upper parts of the legs were fading and were much less tender. The patient stated that the nodules seemed to appear below the knees, descend to the ankles in crops and fade away.

The rest of the physical examination disclosed the presence of hard, fixed nodules, round and smooth, measuring 2 by 3 cm., in the right supraclavicular fossa, which the patient admitted had been present since the middle of 1952. His heart sounds were normal and his lungs were clear to percussion and auscultation. Blood pressure was 135/80. Temperature was normal, but his legs were definitely warmer than the rest of his body. Arterial pulsations in the legs were palpable. No varicose veins were present. There was a well-healed sinus tract above the left ear which had been lanced many times in the past.

The patient was given parenteral penicillin, receiving 1,800,000 units during the next three days. There was only slight improvement. Subsequently, he was given 100 mg. of erythrocin every four hours for two days. There was no improvement. On April 8, the patient was admitted to a hospital.

Laboratory data—When admitted, the patient's urine was negative for albumin or sugar and had a specific gravity of 1.010. Examination of the blood disclosed a red cell count of 4,270,000 with hemoglobin of 13 gm. per 100 cc., and a white cell count of 8000. The smear and differential count were normal. Sedimentation rate (Wintrobe) was 34 mm. per hour, with cell volume of 38 per cent. Wassermann test was negative. Thorn adrenal function test was done and the eosinophils fell from 100 to 17 per cubic millimeter four hours after injection of 50 mg. of ACTH.

Course—The patient received 25 mg. of cortisone, four times a day, and received a low salt diet. By the next day he felt better; the edema of the ankles began to subside and he could walk with some comfort. His sedimentation rate on the fourth day of hospitalization was 36 mm., with cell volume of 45 per cent. The dose of cortisone was maintained at 25 mg., three times a day. On April 11, he was discharged from the hospital much improved. On April 13, the dose of cortisone was reduced to 25 mg. twice a day. On April 22, the patient's legs were much better, but he began to complain of swelling in the neck on the right side. The supraclavicular node noted during the examination began to enlarge. X-rays of the chest were negative. Cortisone was reduced to 25 mg. per day. On April 22, x-rays of both ankles showed "bilateral changes of a degenerative nature, suggesting that the ankles have been subjected to repeated episodes of more or less minor trauma." On April 29, the patient was referred to a surgeon (Dr. Glenn Bell, University of California Hospital, San Francisco) for biopsy study of the neck tumor. The incised tumor contained much thick, greenish pus. Sections of the biopsy specimen were sent for pathologic and bacteriologic investigation. The impression of the surgeon was that he was dealing with a cold abscess of a lymph node.

Pathologic report—(Dr. Hishiar Shamdin, University of California Hospital, San Francisco): "The lymph node section shows epithelial hyperplasia and the formation of tubercles with the presence of Langhans' multinucleated giant cells. Large areas of caseation are present with calcareous deposits. There are confluent tubercle-like structures with central elongated areas of necrosis and nuclear

FIGURE 1 *(left)*. After cortisone therapy. Section of the lymph node shows epithelial hyperplasia and formation of tubercles with presence of Langhans' multinucleated giant cells.

FIGURE 2 *(right)*. After cortisone therapy. Section of the same lymph node shown in figure 1 indicates evidence of suppuration and infiltration of the surrounding fat by the inflammatory cells. Many giant cells are present.

degeneration with few lymphocytes. These central areas are surrounded by zones of epithelioid cells and lymphocytes. Dense fibrocollagenous tissue is seen between the above structures. There is evidence of suppuration and infiltration of the surrounding fat by chronic and acute inflammatory cells and extension of the process of fibrosis. (Figures 1 and 2.)

"After prolonged search for acid-fast bacilli a few were found in microscopic sections. Cultures, however, remained negative. Final impression was that of tuberculous adenitis with suppuration."

Progress—On May 4, cortisone administration to the patient was cut to 12.5 mg. per day. It was discontinued after one week. On May 9, the patient weighed 180 pounds and his blood pressure was 130/80. A Mantoux test was done and was strongly positive in a dilution of 1:10,000. When the patient returned June 4 his weight was 188 pounds. He felt definitely better, but the node was still enlarged. On June 1, x-rays of the chest were negative. The sedimentation rate was 5 mm. per hour. The patient began to receive deep x-ray therapy (Dr. Gordon King, Children's Hospital, San Francisco). During the next three months he received 100 r. every week. On completion of this therapy the node had regressed back to its size before cortisone administration.

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3. Farber, S. and Mendelbaum, H.: Use of cortisone in erythema nodosum. Arch. Int. Med. 88:395, 1951.
4. Mendelbaum, H.: Personal communication to the author.
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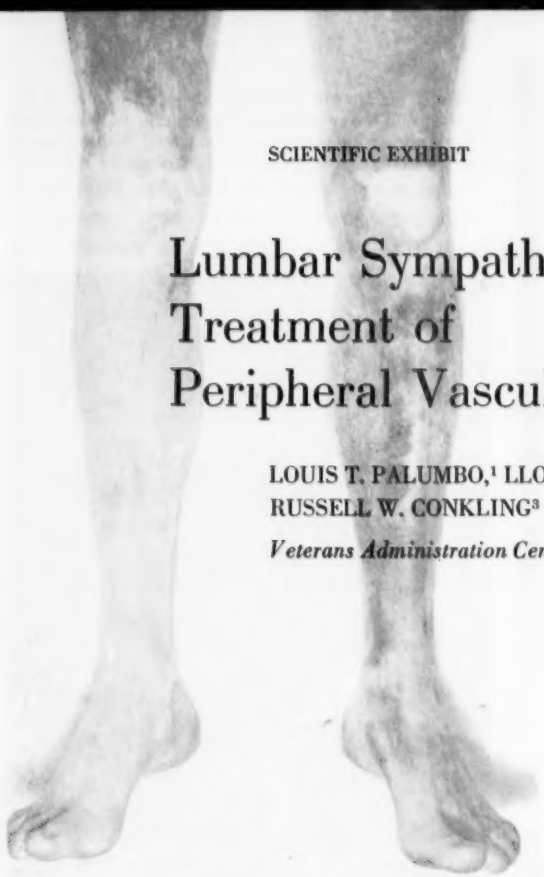
SCIENTIFIC EXHIBIT

Lumbar Sympathectomy in the Treatment of Peripheral Vascular Disease

LOUIS T. PALUMBO,[1] LLOYD F. QUIRIN[2] AND RUSSELL W. CONKLING[3]

Veterans Administration Center, Des Moines, Iowa



THE PRIME FUNCTION OF LUMBAR SYMPATHECTOMY IS TO RELIEVE VASOSPASM AND TO PERMIT THE DEVELOPMENT OF COLLATERAL VASCULAR CHANNELS

A Variety of Diseases and Conditions is Included, as Listed on the Charts to Follow

Two Hundred-Twenty Lumbar Sympathectomies were Performed on 159 Male Patients in a Five Year Period

Follow-up Period on These Patients Varied from Four Years to Six Months

A favorable result will follow sympathectomy if lumbar sympathetic block produces:

Increased warmth	Dryness of the skin
Relief of pain	Increased walking distance
Increase of peripheral circulation	Reduction of edema

Results were considered favorable in 86 per cent of the preoperative procaine lumbar blocks.

● Advanced age is not of itself a contraindication to lumbar sympathectomy.

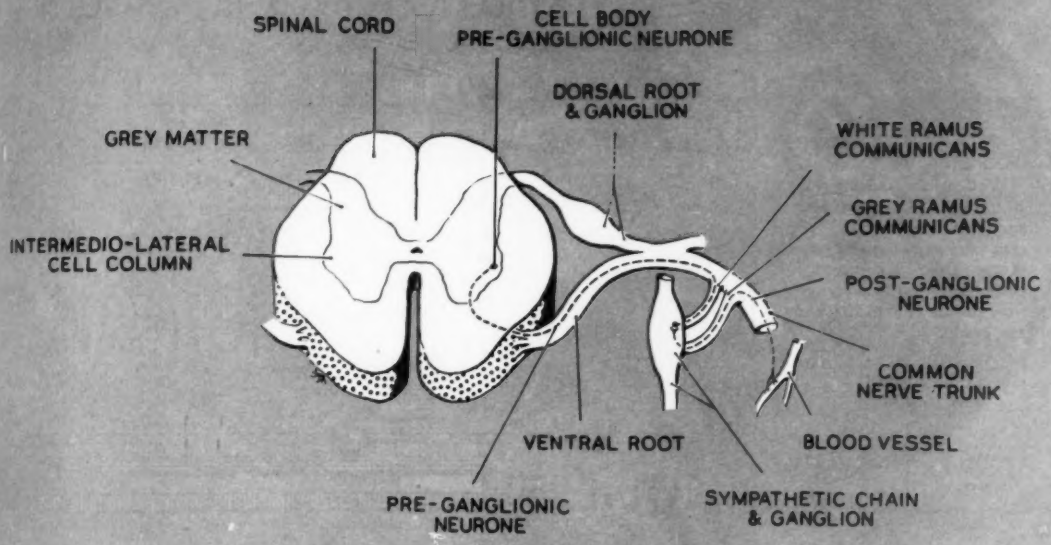
Adapted from an exhibit presented at the 1953 Annual Meeting of the American Medical Association, New York City.

[1]Chief, Surgical Service, Veterans Administration Center, Des Moines, Iowa.

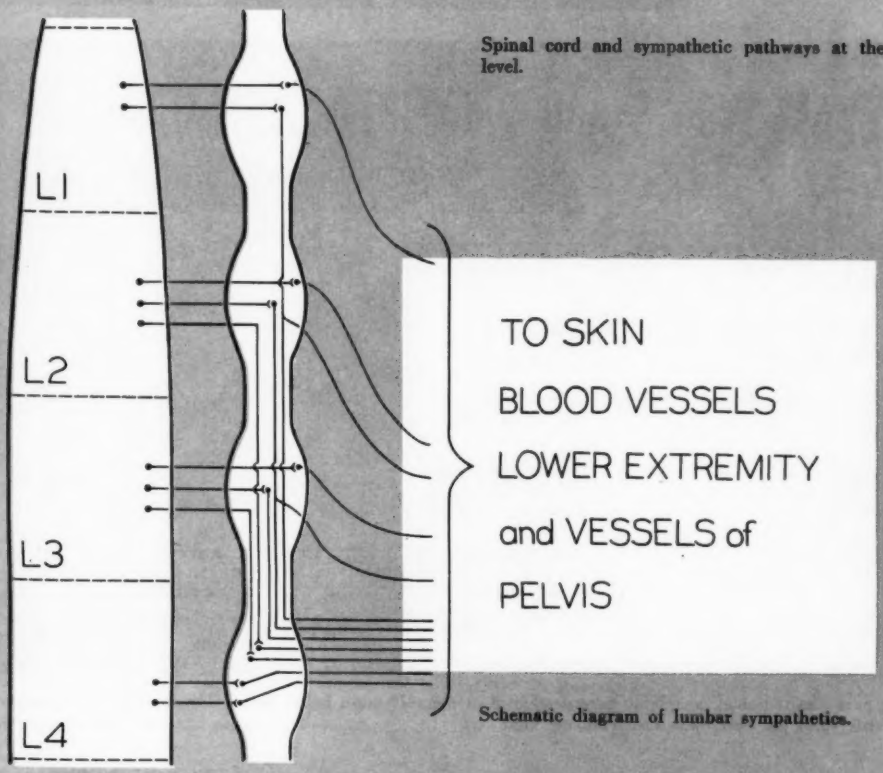
[2]Now in private practice in San Francisco, California.

[3]Now with Surgical Service, Veterans Administration Hospital, Iowa City, Iowa.

The Neuroanatomy...



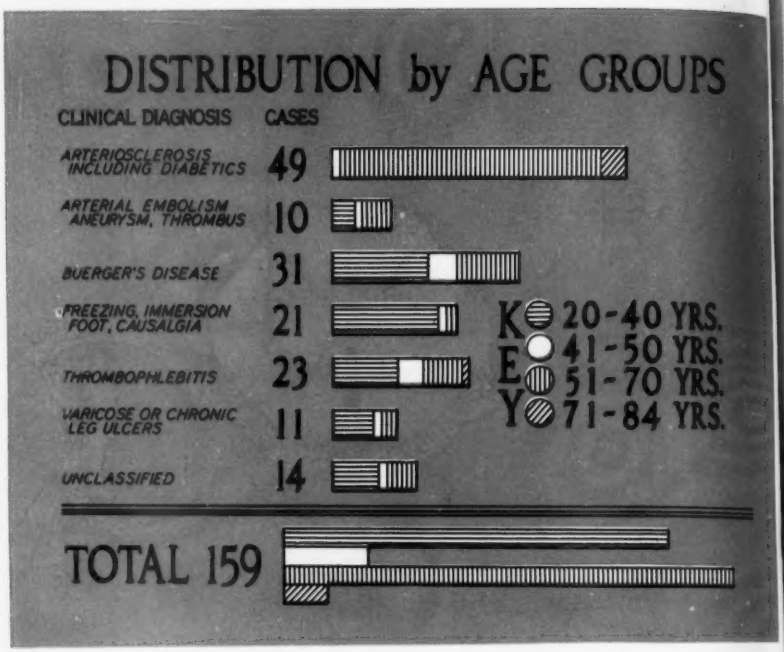
Spinal cord and sympathetic pathways at the lumbar level.

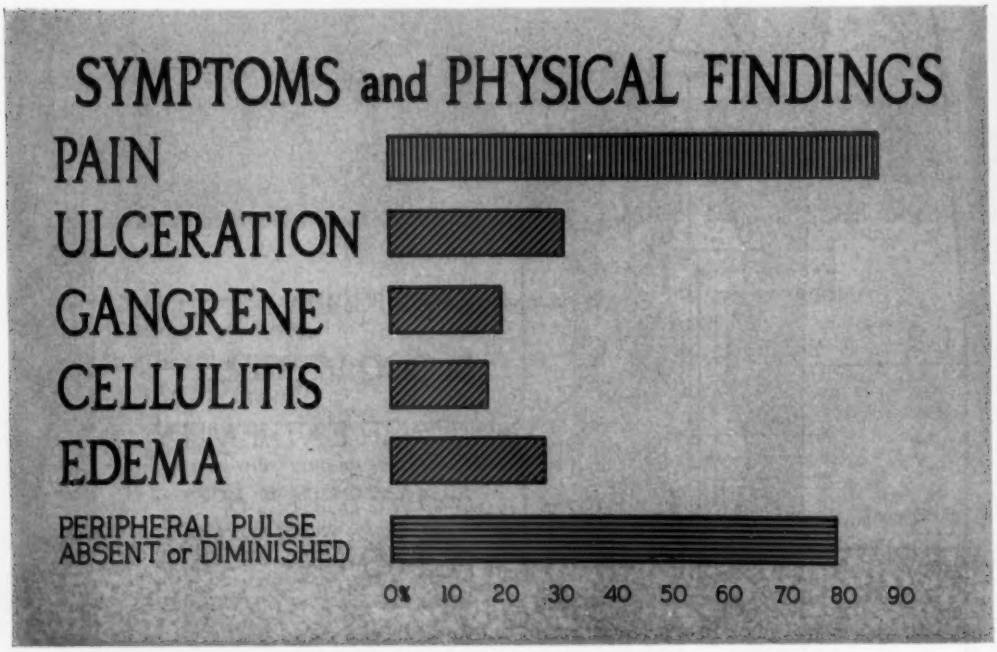


Schematic diagram of lumbar sympathetics.

Statistically speaking...

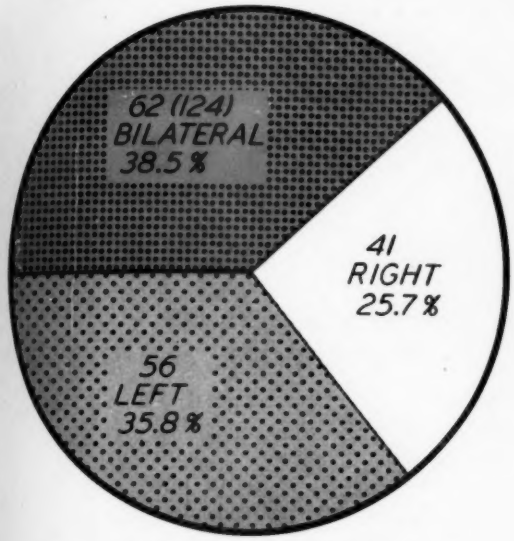
Patient age ranged from 20 to 84 years, with an average of 45.5 years; 15 per cent were more than 60 years of age. Over 85 per cent of patients with arteriosclerosis were in the 51 to 70 year age group.





Disabling pain was the chief complaint in more than 8 of every 10 cases in the series. The incidence of ulceration and gangrene (35.4 per cent) was also relatively high.

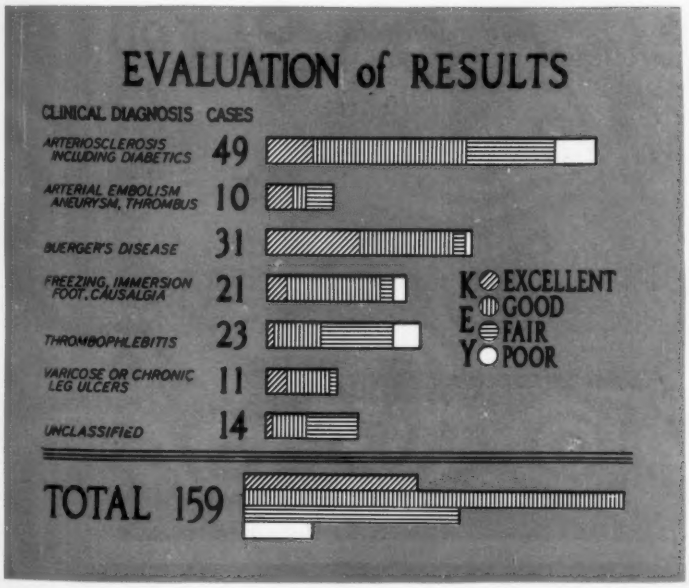
OPERATIONS PERFORMED



More than one-third of the cases required bilateral lumbar sympathectomy. The opposite side was performed after the seventh day.

USE OF TOBACCO

Throughout the entire series, the predominance of heavy smokers was significant.

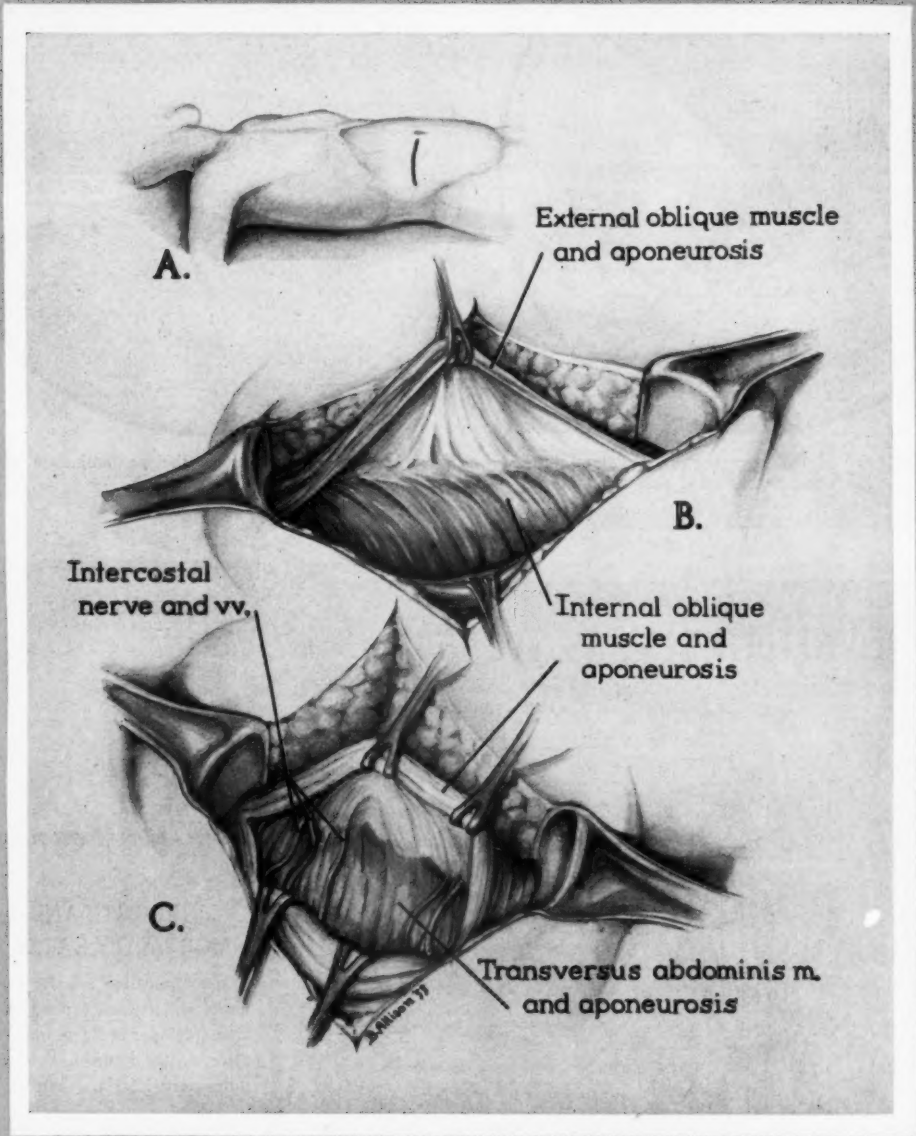


The over-all benefits of lumbar sympathectomy in peripheral vascular disease appear encouraging and worth while. The beneficial effects are relief of pain, a dry and warmer extremity, reduction of edema, improvement of cellulitis, and more rapid healing of ulcers and amputation stumps.

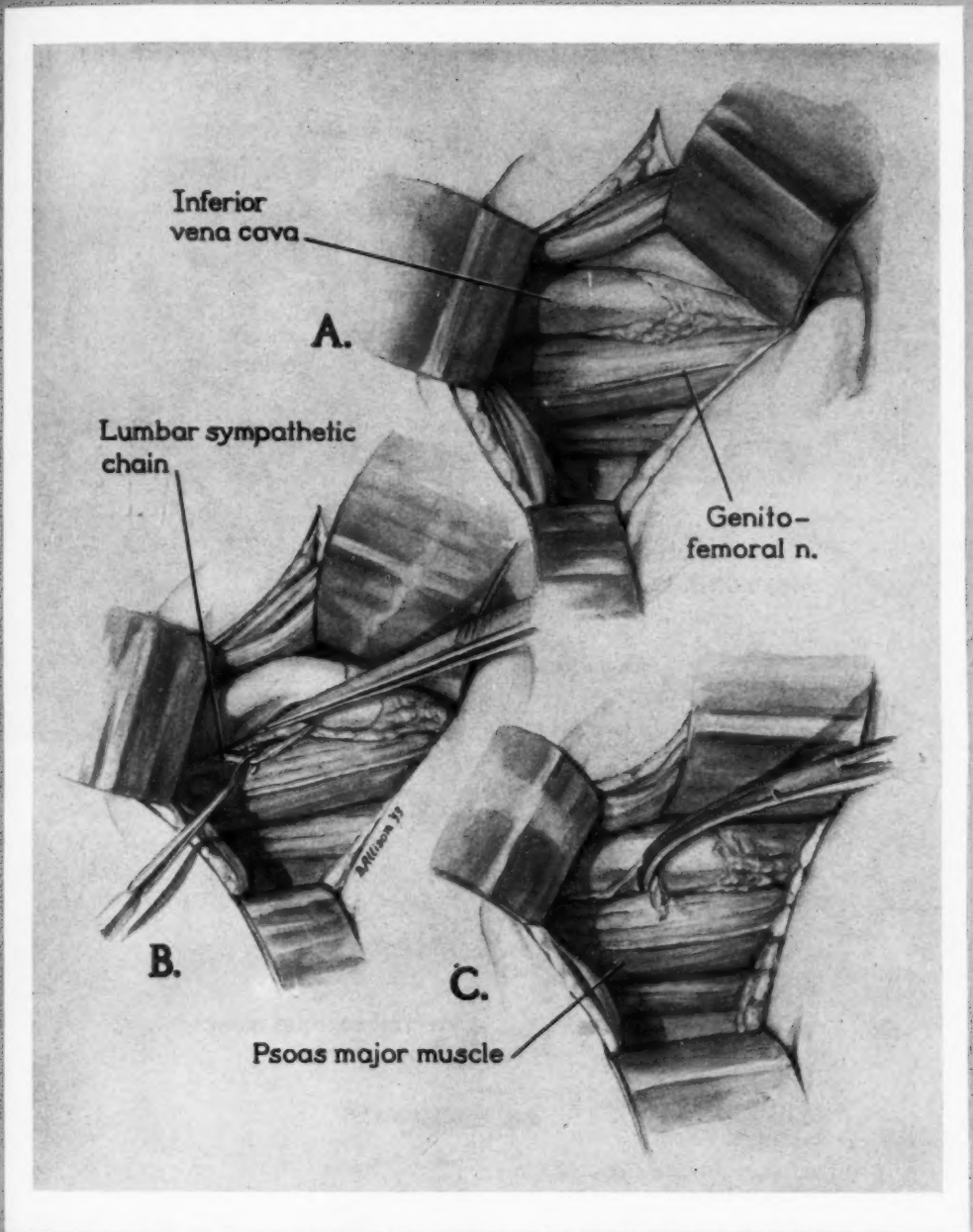
MORBIDITY AND MORTALITY RATES

The complication rate for the entire series was 3.6 per cent. One (0.45 per cent) postoperative death occurred due to pulmonary infarct.

The Operative Procedure...



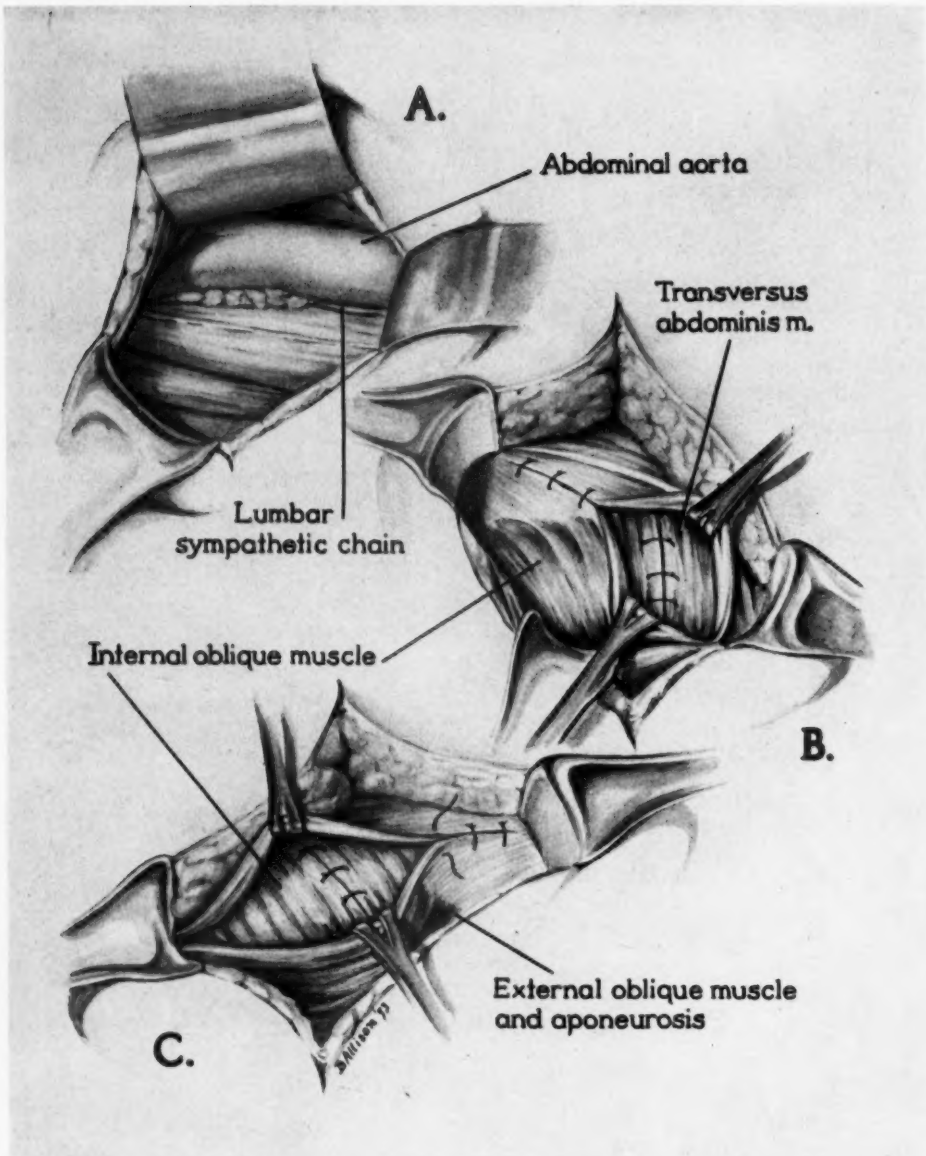
A. Skin incision.
B. Babcock clamps retract divided edges of external oblique muscle and aponeurosis.
C. Babcock clamps retract divided internal oblique muscle with exposure of transversus muscle.



A. Peritoneum and extraperitoneal fat retracted anteromedially, exposing right retroperitoneal space. Inferior vena cava and psoas muscle are seen.

B. The inferior vena cava displaced anteriorly and lumbar sympathetic chain elevated by nerve hook.

C. Divided distal end of chain is grasped and dissection continued proximally.

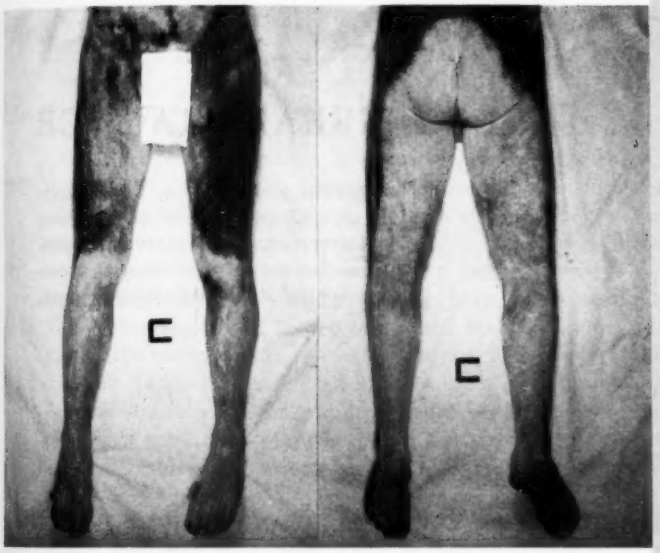


A. In a left lumbar sympathectomy, retroperitoneal space reveals abdominal aorta, left common iliac artery with portion of sympathetic chain lying behind aorta. Left genitofemoral nerve overlies the psoas muscle.
B. Suturing of the transversus abdominis and internal oblique muscles with interrupted 00 silk.
C. Suturing of the internal and external oblique muscle with 00 silk.

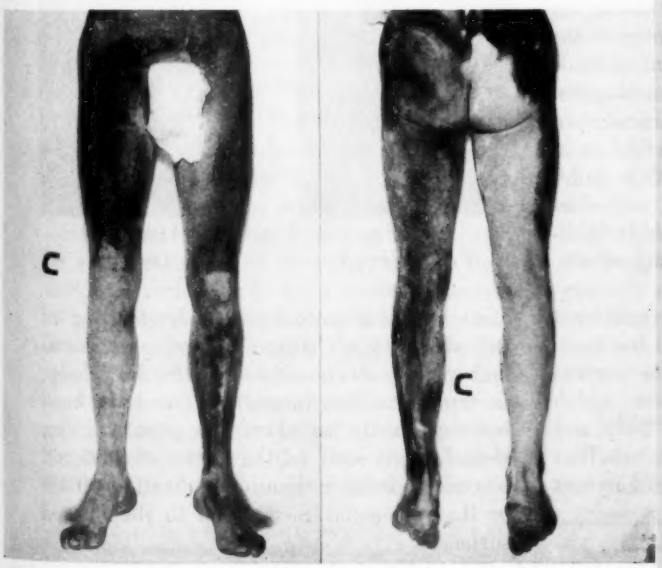
Postoperative sweating patterns . . .

POSTOPERATIVE SWEATING TESTS WERE PERFORMED IN 61 PER CENT OF THE CASES; 87.8 PER CENT SHOWED TYPICAL DENERVATION PATTERNS

Typical Sweating Patterns Following Lumbar Sympathectomy



Bilateral lumbar: Absence of sweating (light areas) denotes sympathetic denervation.



Right lumbar.

Summary and Conclusions

OVER-ALL RESULTS WERE FAVORABLE IN 92 PER CENT

- The greatest benefits were apparent in Buerger's disease, varicose or chronic leg ulcers, and freezing and immersion foot cases.

- The morbidity and mortality rates were extremely low.

- A more conservative attitude toward amputations can be adopted following this policy of therapy. Of 21 major amputations in these patients, 13 (61.9 per cent) were accomplished below the knee.

- Lumbar sympathectomy in patients showing a vasospastic element and an elastic potential to the vascular bed will result in a more complete and relatively rapid rehabilitation.

- Neither undesirable physiologic sequelae nor physical disability will result from this operation.

Pediatrics IN GENERAL PRACTICE

For general practitioners, who handle more than 85 per cent of all pediatric care, POSTGRADUATE MEDICINE *here presents authoritative, up-to-date summaries by specialists in pediatric problems.*

Emergency Treatment of Burns in Children

MARK B. COVENTRY* AND
GEORGE B. LOGAN**

Mayo Clinic, Rochester, Minnesota

THE treatment of the acutely burned child does not differ materially from that of the acutely burned adult. Combating shock, relieving pain, carrying out local therapy to the burned areas, instituting replacement of fluids and electrolytes, administering antibiotics, and possibly using cortisone or corticotropin (ACTH) must all be done in the child as in the adult. When one is dealing with a child, differences in age, size, and fluid and electrolyte reserves must be considered. In addition, difficulty in the technic of fluid administration may arise.

MARK B. COVENTRY

GEORGE B. LOGAN

The historical background of the treatment of burns is a matter of record, and has been summarized elsewhere.[1] It should be emphasized that the changes in metabolism which occur after burning of the human body and the increase in knowledge of body metabolism which has occurred in the past 10 to 15 years have led to a more basic understanding of the physiologic changes occurring in burns and to the subsequent use of this knowledge in treatment. The mortality rates have been lessened as the mind of the physician has been focused more on the matter of fluid and electrolyte balance than on application of this or that particular medication to the burned surface.

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**Section of Pediatrics, Mayo Clinic, Rochester, Minnesota.

TABLE 1

SUGGESTED DOSAGE FOR CHILDREN HAVING ACUTE BURNS*

DRUG	AGE, YEARS				
	1	4	8	12	Adult
Codeine sulfate	¼ gr. (16 mg.)	½ gr. (32 mg.)	1 gr. (65 mg.)	1½ gr. (100 mg.)	1½ gr. (100 mg.)
Morphine sulfate		1/24 gr. (2.7 mg.)	1/16 gr. (4 mg.)	1/12-1/8 gr. (5.4-8 mg.)	1/6-1/4 gr. (10-16 mg.)
Demerol hydrochloride	13 mg.	25 mg.	50 mg.	75 mg.	100-150 mg.

*Dose usually repeated every four hours as necessary.

The prognosis in burns is partly dependent on the age of the patient. Apparently, the ability to withstand the severe trauma of an extensive burn is inversely proportional to the age. Moyer† has stated that "Age is a lethal factor that should be added to the burn." Burns involving 30 to 45 per cent of the body surface in patients over the age of 60 are invariably fatal. This extent of burn in a child is not considered lethal, and we have seen one child survive with 90 per cent of the body surface involved by second and third degree burns.

Three stages of burn are generally recognized, but only the stages of shock and toxemia will be discussed in this paper. The stage of anemia and hypoproteinemia which occurs after these first two stages have passed is not a problem for emergency attention.

Selection of Patients for Hospital Admission

The condition of the burned child should be evaluated carefully in the hospital emergency room or in the doctor's office, and the decision made whether he needs hospital care or can be handled as an outpatient. A small first or second degree burn covering an area as much as 4 or 5 inches square can usually be taken care of readily in an outpatient way. If the burn involves a surface equal to one extremity or more, disturbances in body metabolism may be expected, and hospitalization is advisable. If the burn is about the hands or perineum, hospital admission is also indicated, for special attention is required in such cases. Also, children with deep or third degree burns of a thermal or chemical nature, regardless of extent, probably should be admitted to the hospital. There is no hard-and-fast rule to follow, but the above serves as an index. The age of the patient is of some consideration, and it is probably best to admit infants 2 years of age and under unless the burn is extremely trivial both as to degree and to extent.

Pain

Evaluation of pain in the infant and young child is more difficult than in the adult. Circulatory and respiratory depressants should be used only with great caution. Pain from burns is usually fairly transient and is seldom severe by the end of the first 24 hours.

Codeine, morphine and DEMEROL® are the drugs commonly used to control pain. Unless one is quite experienced in using morphine in small children, its administration is best omitted. Table 1 may be used as a guide to dosage.

The severity of the pain and the effect of the drug on the child must be used as the real guide to adequate dosage. It is important that injections of the drugs be given at sites where circulation is good so that there will be prompt absorption.

Tetanus Prophylaxis

Tetanus antitoxin or a booster dose of tetanus toxoid should be administered when the patient is first seen. If it is not known whether the child has been actively immunized against

†MOYER, C. A.: On Burns. Edited by Nathan A. Womack, Springfield, Illinois, Charles C Thomas, 1953.

tetanus, 5000 units of tetanus antitoxin should be given intramuscularly. The usual precautions should be taken to be sure that the patient is not sensitive to horse serum. If the child has been previously immunized against tetanus, then 1 cc. of fluid tetanus toxoid should be administered intramuscularly.

It is not our practice to give gas gangrene antitoxin. Its questionable benefits as a preventive of gas gangrene and the dangers of serum sickness overbalance the possible helpful effects. Gas gangrene is extremely rare in burns, though it is a theoretical complication, especially in deep burns.

Shock

The blood pressure and pulse should be determined immediately when a badly burned child is examined, and the child should be observed for the usual signs of shock—weak thready pulse, low blood pressure, pale moist skin, thirst, and possibly marked excitement or coma. Shock should be treated immediately, before any consideration is given to treatment of the local burned area. The patient should be kept moderately warm, and elevation of the lower extremities may help.

Whole blood is the best agent with which to combat shock. Whole blood was formerly objected to because of the apparent hemoconcentration present during the early phases of a burn, but it has been found that the apparent concentration of erythrocytes in the circulating fluid is due to a marked decrease in blood serum volume. Actual hemolysis follows a burn, with destruction of erythrocytes. Transfusions of whole blood provide not only needed erythrocytes but also the additional serum required because of the rapid depletion that occurs in patients with severe burns. It is, of course, preferable to cross match the blood before transfusion. In a strict emergency, universal donor blood (group 0, Rh negative) can be used, but it is probably preferable to give plasma or one of the plasma substitutes, such as dextran, while waiting for the cross match to be made. Administration of whole blood is indicated, therefore, not only in the emergency treatment of shock but also in the replacement of plasma and erythrocytes lost within the first 24 or 48 hours after burning. Adults with severe burns may require as much as 2000 cc. of blood given intravenously in the first 24 hours. Children may need proportionately large amounts, as is indicated in the next section.

Fluid and Electrolyte Therapy

An acutely burned child requires fluid, electrolytes and food not only for his daily needs but also, and more importantly, to replace that which is being lost at the site of the thermal injury or by vomiting. One must plan an adequate intake for such a child and make sure that the route of administration will assure its prompt availability. If the intake is too small, the child may have poor renal function. If the intake is too great, there is danger of pulmonary edema.

A number of schemes have been devised to help the physician choose the proper fluids, the quantity to be given, and the route of administration. Any which fulfill the desiderata of Wallace[2] are satisfactory: (1) The quantity of fluid given is proportional to the area from which fluid is being lost. (2) The rate of administration is parallel to the rate of local fluid loss; that is, greatest in the first eight hours. (3) The amount given is proportional to the patient's normal blood volume.

It is preferable to administer food and fluids orally whenever possible. Recent investigations in Edinburgh[2] have shown, however, that while adults may not need to have fluids given intravenously when less than 18 per cent of their body surface is burned, children usually need such administration when 12 per cent or more of body surface is burned.

If there is the least doubt that parenteral therapy will be necessary, an intravenous needle should be inserted promptly. If prolonged administration is anticipated, a plastic type of needle should be used. The subcutaneous route should not be employed. If no veins are available, an intrasternal needle can be used for both fluids and blood.

A tube inserted through the nose and into the stomach is often helpful as a means of administering both fluids and food. If it is pushed into the duodenum, vomiting is less

TABLE 2

ELECTROLYTE CONTENT OF SOLUTIONS
(MEQ. PER LITER)

SOLUTION	NA	CL	LACTATE	OTHER ELECTROLYTES
0.9% NaCl	155	155	0	0
Ringer-lactate	128	103	25	K, Ca, Mg
Sodium chloride, lactate and glucose	130	105	25	0

likely to occur. In order to avoid nasal and esophageal irritations, such a tube should not be left in place for more than four or five days at a time. Ulcers at the lower end of the esophagus almost always occur if the tube is used over a long period. While nasal and pharyngeal irritation may be lessened by the use of small plastic tubes, the occurrence of esophageal ulcers is probably not influenced by such practice.

The extent of the burn is an important factor in determining the amount of fluid to be given. A simple means of arriving at an estimate of the size of the burn is by employing the so-called rule of nine:[2] head 9 per cent, each arm 9 per cent, each leg 18 per cent, front of chest and abdomen 18 per cent, back 18 per cent and genital area 1 per cent.

The amount of fluid to be administered is also dependent on the weight of the child. Regardless of the severity of the burn, one should seldom give more fluid in 24 hours than an amount equivalent to 10 per cent of the patient's weight. The amount to be given must be gauged by the child's condition. A helpful rule to follow is that of Evans[3] in which 1 cc. of electrolyte solution is given intravenously per kilogram of body weight for each 1 per cent of body surface burned. One cubic centimeter of colloidal solution (blood, plasma or plasma substitute) is also given intravenously per kilogram of body weight for each 1 per cent of body surface burned.

In addition, 30 to 50 cc. of 5 per cent solution of glucose per kilogram of body weight is given orally. Until renal function is known to be adequate, milk and fruit juices are best omitted so as to avoid hyperkalemia. It is wise to follow the recommendations of Cope and Moore[4] and install a urethral catheter. An output of 25 cc. of urine per hour for a child indicates adequate function. A diminution of output denotes the need for a greater intake of fluids, while an output of more than 50 to 60 cc. usually means that the intake is excessive. In adults the output of urine should range from 50 to 150 cc. per hour. Half of the intake for the first 24 hours should be given during the first eight hours after the burn. An amount equivalent to half of the total intake for the first 24 hours is given during the second 24 hours.

The choice of fluid is important. During the acute stage of the burn, when the greatest loss of fluid occurs, sodium and chloride are the chief ions lost. As the edema begins to subside in 48 to 72 hours after the burn, a portion of the electrolytes lost into the edema fluid is resorbed into the circulation. It is important, therefore, to administer considerable sodium, chloride and water during the first 48 hours only and to give less in the subsequent 48 to 72 hours.

Physiologic solution of sodium chloride (0.9 per cent) is frequently recommended for intravenous use. Ringer-lactate (Hartmann's) solution is also recommended. It is approximately isotonic, and contains sodium, chloride and lactate (potential bicarbonate) as well as 5.4 mEq. of potassium per liter and smaller quantities of calcium and magnesium. Another satisfactory solution may be made by mixing the following: 0.9 per cent solution of sodium chloride, 670 cc.; 1/6 molar sodium lactate, 150 cc.; and 5 per cent solution of glucose, 180 cc. The content of the foregoing solutions is indicated in table 2.

The oral administration of fluids should be begun as soon as it can be tolerated. If the oral route is to be used in whole or in

great part, it is essential during the first 48 hours to give Moyer's mixture (sodium chloride, 3 to 4 gm. or 1 teaspoonful; sodium bicarbonate, 1.5 to 2 gm. or 2/3 teaspoonful; and water, 1 quart) rather than pure water,[5] or else water intoxication may occur. If renal function is adequate, milk and fruit juices may be given freely. Most fruit juices except tomato juice have a high potassium and low sodium content and so are less desirable than milk.

A complete blood count should be made at the time the patient is admitted to the hospital. The hemoglobin should be determined every two or three days. It is helpful to determine the values for sodium and potassium daily for the first 7 to 10 days. This, however, requires the availability of a flame photometer. Administration of extra sodium should be stopped if the concentration in the blood exceeds 145 mEq. per liter, but sufficient sodium should be given to maintain the value above 130 mEq. per liter.

The value for blood chloride may be determined, and this should be maintained between 100 and 105 mEq. per liter. The carbon dioxide combining power should be kept between 20 and 25 mEq. per liter. After the acute period is over, the values for blood protein must be determined periodically.

It should be remembered that the described chemical determinations will require rather large amounts of blood unless one's laboratory is equipped to carry them out by micromethods. The number of veins available is limited in a child and the extent of the burn may limit the number still further. Blood for examination by micromethods may be obtained by puncture of a finger, toe or heel, though even the sites for these punctures may be limited by the burn.

Cortisone and Corticotropin

The treatment of burns with cortisone and corticotropin is still in an investigative stage. We have treated several severely burned children with these hormones, and they seem, from our observations, to be of definite value in the stage of shock if the blood pressure cannot be readily raised to normal with the administration of blood, or so-called blood substitutes. At the present time we suggest the dosage indicated in table 3.

TABLE 3

DOSAGE OF CORTISONE AND CORTICOTROPIN

AGE (*Years*)	INITIAL DOSE, MG. PER DAY	
	Corticotropin	*Cortisone*
4	40	50
10	60	125
Adult	80	200

The corticotropin for each day is given intramuscularly in four individual doses every six hours. Total dose for the day may be given in one injection if gel preparation is used.

Cortisone by intramuscular injection is given in one daily dose. If given orally, it must be administered at least three times daily, every eight hours.

The dose should be gradually reduced before use of the hormone is discontinued. The indicated daily dose should be decreased by about one-fourth after the first three days.

After the first 48 hours, when the stage of "toxemia" may commence, the use of cortisone is probably of no value, and during the third stage, namely that of anemia and hypoproteinemia, cortisone is definitely not indicated and may actually be harmful as it tends to mask infection so common in this stage of burns.

Side effects from the use of cortisone in the treatment of burns may occur, and the clinician should be aware of the following possibilities: (1) Adrenocortical function may be suppressed even with relatively small doses of cortisone. Thus, if skin grafting or some other surgical procedure is to be contemplated after the administration of cortisone, the patient should be fully protected from adrenocortical insufficiency and shock during the operative procedure. This protection is accomplished by the use of cortisone before, during and after such a surgical procedure. (2) If a peptic ulcer is present (and Curling's ulcer may occur in children), cortisone may act as an aggravating factor, allowing perforation. (3) As we have indicated, corti-

sone may suppress the usual signs and symptoms of intercurrent infection; hence, when it is used in the treatment of burns, such infections should be watched for carefully and antibiotics should be used freely. (4) Cortisone given to patients with diabetes may cause the disease to become more difficult to control.

In spite of these possible hazards, it is only fair to say that we have seen a child survive after as much as 90 per cent of the body surface was burned, and it is our feeling that this survival was due, at least in part, to the use of cortisone during the initial stage of the burn.

Local Treatment

The burned areas, whether the burns are of first, second or third degree, should be handled as surgical wounds and taken care of in as aseptic a manner as possible. As soon as the child's general condition has been evaluated and the treatment of shock, if indicated, has been instituted, attention should be focused on the burned areas. One should decide as soon as possible whether to treat the patient by the "open" or "closed" method. Wallace,[6] in 1949, revived the interest in the open method of treatment. Blocker and co-workers[7,8] have used the open treatment extensively and in their writings have listed the advantages as they see them. Whether the open or closed method is elected, one should not do more than superficial debridement of the burned areas, removing any gross dirt particles, grit, sand, adherent clothing and so forth. The burned areas may be cleansed with soap, sterile water and cotton.

If the closed method of treatment is elected, the burned areas are dressed with dry gauze, petrolatum-impregnated gauze or nitrofurazone (FURACIN®)-impregnated gauze, depending on the wishes of the surgeon. We have found no particular difference in the rate of wound healing, incidence of infection, or amount of scarring among these three types of dressing. Over this gauze is placed a bulky cotton dressing, and over the entire dressing is wrapped a slightly compressing elastic bandage. The extremities should be bandaged in a functional position to prevent the occurrence of contractures. The pressure from the elastic bandage probably does not prevent any loss of plasma, but it may be conducive to more rapid healing. The dressings must be changed every five to seven days because of their soiling and odor. Burns about the face are generally left open as are burns about the perineum.

With the open method of treatment the burned surfaces are not dressed, but the patient is laid on a sterile sheet in a bed, preferably covered by a canopy to protect against drafts. The room should be comfortably warm, at approximately 75° F. The burned areas are allowed to crust over and are not touched or dressed except where infection may be obvious underneath the crust, or where a crack occurs in the crust. In such cases the crack or the infected area is excised and a piece of sterile gauze placed over the opening.

Proponents of the open method of treatment feel that there may be less disturbance of the electrolyte balance with this form of treatment because there is less plasma lost into dressings. They also claim that the treatment is less painful because of lack of dressings, and that it is less expensive for the same reason. In addition, the period of hospitalization may be shorter with this form of treatment. The mortality rate, however, is admittedly about the same with both forms of treatment. It is not within the scope of this paper to discuss the problem of skin grafting, but skin grafting should be carried out just as early as possible.

Antibiotic therapy should be started when the patient enters the hospital. Penicillin given intramuscularly in the form of the procaine salt is usually employed. It is the antibiotic best suited for long-term administration. It has the disadvantage of a limited bacterial spectrum. Some children are sensitive to the drug and this must be ascertained prior to the institution of therapy. The giving of streptomycin or dihydrostreptomycin or a combination of both intramuscularly concomitantly with penicillin is often a wise procedure to broaden the bacterial spectrum.

AUREOMYCIN® and TERRAMYCIN® may be

given intravenously for short periods when the foregoing regimen has failed and when the infecting organism or organisms are sensitive to one or the other of these antibiotics. These drugs as well as ERYTHROMYCIN® are usually given by mouth, but often may be given for only limited periods owing to intolerance of the drug by the patient.

The suggested dosage for the antibiotics mentioned is as follows:

Penicillin: 300,000 units a day. This dose may be increased to 600,000 or 2,000,000 units.

Streptomycin and dihydrostreptomycin: 10 mg. per pound of body weight per 24 hours, given in one or two doses a day.

Aureomycin: 10 to 20 mg. per pound of body weight per 24 hours, divided into three or four doses and given orally.

Terramycin: 10 to 20 mg. per pound of body weight per 24 hours, divided into three or four doses and given orally.

Erythromycin: 15 mg. per pound of body weight per 24 hours, divided into four to six doses and given orally.

The sulfonamide drugs may be used if renal function is and continues to be adequate. The triple combinations, or the more soluble drugs such as sulfisoxazole (GANTRISIN®) and sulfadimetine (ELKOSIN®), are preferable.

Antibiotic and chemotherapy should be continued, if possible, until skin grafting has been completed or until the burns have healed.

Food and Vitamins

Vomiting and anorexia are encountered frequently in children who have been burned. Adequate nutrition is essential to good healing of the thermal lesions and the recovery of the patient. If the patient is unable to take adequate food, a nasal tube should be used as has been mentioned. There is no feeding mixture which is universally tolerated. We are, at present, using the following formula: whole milk, 1000 cc.; whole eggs, 200 gm.; DEXTRI-MALTOSE® No. 1, 100 gm.; cream 20 per cent, 200 cc.; skim milk powder, 90 gm.; sodium chloride, 5.5 gm.; and VITIKON® (Upjohn), 5.0 cc. This mixture contains 2,140 calories in 1500 cc. of solution (1.4 calories per cubic centimeter), including 205 gm. carbohydrate, 98 gm. protein and 102 gm. fat.

Vitamins should be given in addition. There is no evidence that the burned child needs extra amounts of the fat-soluble vitamins A and D—the standard daily dose of 5000 units of A and 400 units of D is adequate. There is, however, evidence that injuries, particularly burns, increase the need of the patient for the water-soluble vitamins, especially C. One gram of ascorbic acid should be given daily to an adult or teen-aged child. Smaller children might be given 0.5 gm. and infants 0.3 gm. a day. Two to five times the usual daily intake of the various B vitamins is recommended for patients who have been burned.

Outpatient Treatment

Most children not burned sufficiently to require treatment in a hospital should have their burns dressed with petrolatum or nitrofurazone (Furacin) dressings. These dressings should be thoroughly "anchored" as children tend to pull at their bandages. The patient can be seen every two days or so for inspection, and the daily administration of penicillin for the first five to seven days is usually indicated. Most second degree burns heal within 7 to 14 days in infants. Application of a greasy-base lotion or ointment is indicated for several weeks after the burn to keep the skin soft and pliable and to substitute for the necessary skin oils lost in burning.

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Neurologic Complications of Systemic Disease

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THIS report is concerned with those conditions or diseases in which the primary locus of action of the causative agent does not include the central nervous system, but in which symptoms referable to this organ system may occur. In many such situations the reason for the development of central nervous system symptoms is not clear, while in some the primary disease results in metabolic or circulatory disturbances which, in turn, lead to altered function of brain and spinal cord. It is obviously impossible to include all situations of this sort; consequently a few situations of clinical importance in the field of pediatrics have been selected for discussion.

Let us first consider the "postinfectious" encephalitides, with particular reference to those virus diseases which are especially prevalent in infancy and childhood. Table 1 is a compilation of the incidence of postinfectious encephalitis as reported by various authors. It is difficult to obtain precise figures for the incidence of the common virus diseases of childhood and even more difficult to ascertain the exact frequency of these particular complications. For example, an incidence of 0.2 per cent for postvaricella encephalitis would certainly appear to be too high in view of the experience of many clinicians. Some authors feel that antirabies vaccine produces symptoms much more frequently than is indicated in the table. Nevertheless, the data in the table represent the best available estimates at the present time.

TABLE 1

POSTINFECTIOUS ENCEPHALITIS

DISEASE	INCIDENCE OF CNS COMPLICATIONS	PERMANENT SEQUELAE *(per cent)*	MORTALITY RATE *(per cent)*
Rubeola	1/1000	20-40	10
Rubella	1/6000	4	20
Varicella	1/500	30	5
Vaccinia	1/4000* 1/110,000†	5	10-30
Antirabies vaccine	1/3000	low	15

*European data

†New York City data, 1947

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This article is based on an address presented to the Northwest Pediatric Society, Bayport, Minnesota, 1952.

The pathologic changes seen in the central nervous system differ from those of primary viral encephalitis, and consist principally of perivascular demyelination, thrombosis and hemorrhage. By contrast, true virus infections exhibit meningeal infiltration, perivascular "cuffing" with leukocytes and variable degrees of neuronal necrosis. However, correlation of symptoms with pathologic change has been difficult.

As a rule, symptoms are first noted during convalescence, and consist of one or more of the following features: fever, headache, nuchal stiffness, convulsions, disorientation, cranial nerve palsies, apathy, disordered sphincter control, incoordination and coma. Moderate elevation of cerebrospinal fluid pressure and protein content, and mild pleocytosis (mononuclear cells predominating) are characteristic. On occasion symptomatology is primarily directed toward the cerebellum (pseudo brain abscess), the spinal column (transverse myelitis, ascending motor paralysis) or the eye (neuromyelitis optica).

Recovery is the rule, yet an appreciable number of patients are left with residua, such as disordered personality, mental retardation, convulsive disorders, muscle incoordination, or rarely, sexual precocity. The percentage of patients exhibiting sequelae varies, but may be as high as 30 per cent (table 1). Although the actual number of children who have postinfectious encephalitis is small, it should be emphasized that the residual manifestations are usually permanent and may present difficult problems in rehabilitation. Although corticotropin and cortisone have been found effective in experimentally induced encephalomyelitis, critical evaluation of the use of these substances in human disease is not yet available. As physicians, the preventive aspects of the problem demand our full consideration at the present time.

Modification of rubeola through an appropriately timed injection of gamma globulin is now common practice, and it is the opinion of many clinicians that the modified disease is less apt to be followed by encephalitis. However, the necessary statistical data required to give an accurate answer to this question are not yet available, and, indeed, a note of caution is desirable at this stage of our knowledge in view of a recent report noting the occurrence of encephalitis in children with modified rubeola.[1] It is also believed that smallpox vaccination has less risk of encephalitis when vaccination is done in early infancy.

The pathogenesis of postinfectious encephalitis is still a matter of dispute, although a number of theories have been advanced: (1) activation of a latent virus within the central nervous system; (2) "toxic" effects and vascular thrombosis, and (3) an allergic response to tissue damaged by the infectious agent. The allergic theory has received support from experiments performed by Morgan,[2] Kabat and others[3] in which symptoms not unlike those observed in human postinfectious encephalitis were produced in animals by injections of brain tissue preparations. The fact that peripheral and central nervous system manifestations occur as a result of antirabies vaccination, a procedure involving the multiple injection of spinal cord tissue, also lends support to the "allergic" theory. Suffice it to say that no completely satisfactory explanation has been forthcoming for the occasional occurrence of this dreaded and crippling complication of the common virus diseases of childhood, that no reliable prophylaxis is as yet available, and that no satisfactory method of therapy exists. It is indeed fortunate that postinfectious neurologic complications are relatively rare.

Mumps is complicated by meningo-encephalitis fairly frequently, 5 to 10 per cent of cases exhibiting symptoms and 20 to 30 per cent showing mild pleocytosis. It is probable that most instances represent actual virus invasion of the central nervous system. The symptoms are usually mild and the percentage of patients exhibiting residual manifestations is low, auditory impairment being the most common residuum noted. There has been much interest recently in the neurologic complications of infectious mononucleosis. Since the causative agent (presumably a virus) has not been identified, it is not known whether these complications are due to primary invasion of the central nervous system or to an

allergic reaction analogous to that postulated for measles. A variable symptomatology, including respiratory paralysis and polyneuritis, has been reported, and complete recovery is said to occur in 85 per cent of cases.[4] The virus of herpes simplex can produce encephalitis in man by direct invasion of central nervous system tissue; although such cases are rare, the mortality rate is high.

For many years the association of so-called "febrile" convulsions and roseola infantum has been noted. Many observers have long felt that the high incidence of convulsions in this disease, as compared with other febrile illnesses, merely represented the interplay of several factors: the rapidity of onset of fever, the height of the temperature, and the fact that the age incidence of the disease coincides with that period of childhood in which febrile convulsions are particularly prone to occur. However, recent evidence concerning the transmissibility of this disease to monkeys and to humans is indicative of a virus etiology,[5] and perhaps we should look on the convulsions as a "postencephalitic" phenomenon. Residual manifestations have been noted, in rare instances, in my own experiences. Lack of pathologic observations renders definite conclusions difficult, however.

From the standpoint of the clinician, one of the most distressing features of the syndromes here discussed is that neurologic symptoms may on occasion *antedate* those which involve the specific end organ. Many physicians have had the experience of caring for a patient who exhibited fever, nuchal rigidity, disorientation and pleocytosis for which no cause was apparent until the typical parotitis of mumps made its appearance on the second or third day of the illness. This "preinfectious" type of encephalitis is seen occasionally in mumps and infectious mononucleosis.

Neurologic involvement during the course of pertussis is most distressing. Observed pathologic changes are variable and include hemorrhage and extensive neuronal atrophy. In some instances in which convulsions are a prominent feature autopsy fails to disclose definitive lesions within the brain. Others manifest signs of progressive loss of brain tissue—decorticate rigidity, blindness, optic atrophy and dilated ventricles. These dreaded complications have been observed in young infants more frequently than in older children, and the modern trend toward earlier immunization of infants, together with the availability of effective treatment for the established disease, has done much to reduce the number of cases seen.

On rare occasions encephalopathy has been observed to follow the administration of pertussis vaccine.[6] Although most patients suffer permanent residua, the percentage of patients who develop encephalopathy from this cause is too small to detract from the value of pertussis immunization programs. Of more acute interest is the recent evidence indicating that pertussis vaccine injections, if given during the month prior to the onset of poliomyelitis, may localize the site of paralysis in patients with the disease.[7] Claims have also been made that the incidence of paralysis is actually increased. The evidence on both these points is still statistical in nature, yet some thought should be given to the possibility of postponing routine elective prophylactic immunizations during periods of high incidence of poliomyelitis. Fortunately, there is no evidence that penicillin injections have a similar effect.[8]

The most interesting development concerns the occurrence of rubella in the pregnant woman. The Australian story of the discovery of the cause-and-effect relationship between rubella in pregnancy and congenital defects in the infant is a thrilling chapter in clinical investigation. It is of interest that in 1940—at precisely the time when Gregg was busy correlating the presence of congenital cataracts in his young patients with the occurrence of maternal rubella—the editorial staff of the *Edinburgh Medical Journal* took occasion to commemorate the one hundredth anniversary of the first clinical description of rubella in English by commenting to the effect:

> For one reason and another German measles has been in the news of late, and we hear of medical officers of health, head-masters and head-mistresses and others who are clamoring to have it deprived of its pride of

> place as a notifiable disease and relegated to the limbo of minor exanthemata. It has come to be looked upon by many as a nuisance rather than an illness, and the quarantine regulating it plays havoc with the arrangements of school and hospital authorities. It has even been suggested that the spread of an epidemic among children might be judiciously encouraged, so as to get the thing over as early and as quickly as possible.[9]

Despite this nicely worded echo of modern pediatric thinking, Gregg was able to show that the disease did result in serious defects in young germ plasm,[10] and thus the way was opened to a renewed interest in the pathogenesis of congenital anomalies.

Infants born of mothers who contract this seemingly mild illness early in pregnancy may have a variety of serious defects and deformities: Nerve deafness, cataracts, cardiac abnormalities, mental retardation, and cerebral defects may occur singly or in combination, and the percentage of stillbirths is increased. Although there is general agreement that the risk to the infant is greatest if rubella occurs early in pregnancy and least if it occurs late, there is still considerable uncertainty as to the actual magnitude of the risk involved. Statistical difficulties here are real because of several factors: Symptoms in the affected child may be quite mild, for example, deafness only; most of the defects described can be due to other causes, such as birth trauma or genetic factors, and it is almost impossible to discover how many mothers contracting rubella during pregnancy have given birth to normal children. A recent compilation of available data indicates that the risk of stillbirth is 20 per cent and that of a congenital defect in a living neonate is 14 per cent when rubella occurs in the first trimester, whereas later in pregnancy this is reduced to 7 per cent and 7 per cent, respectively.[11]

The question of the advisability of therapeutic abortion in instances where rubella is diagnosed during pregnancy is a most difficult one. Certainly an attempt to prevent occurrences of the disease in exposed pregnant women through the use of generous doses of gamma globulin is justified, even though its effectiveness in this particular situation does not approach that known to exist in individuals exposed to rubeola. And no one will deny the wisdom of seeing to it that young girls have an opportunity to contract this otherwise mild disease before reaching childbearing age.

Although the evidence which incriminates maternal rubella as a cause for congenital anomalies is incontrovertible, attempts to prove a similar teratogenic role for other virus diseases must be classed, at the present time, as only moderately suggestive. Vaccinia, mumps, poliomyelitis and infectious mononucleosis are now under study in this regard.

A number of other diseases may be associated, in certain patients, with central nervous symptoms and signs of variable type and severity. Convulsions or visual impairment may herald the onset of acute glomerular nephritis or become manifest during the course of the disease. A high percentage of patients with sickle cell anemia have been shown to have abnormal electroencephalographic tracings,[12] and convulsions, hemiparesis and the like may be seen in patients suffering from this disease. One must always keep in mind the well-established observation that hypocalcemia and lead intoxication, two conditions most frequently thought of in connection with symptoms referable to the peripheral nervous apparatus, usually produce central nervous symptoms in infants and children. Situations in which marked dehydration develops may result in thrombosis of the major venous sinuses of the brain with subsequent convulsions, increased intracranial pressure, permanent residua or death. Dehydration in the infant constitutes a medical emergency and should be treated promptly and effectively.

It is becoming apparent that disease of the central nervous system may complicate congenital heart disease. Brain abscess is more common here than in children with normal hearts.[13] In a recent series of 162 consecutive autopsies of patients with congenital heart disease it was found that 27 showed evidences of cerebral infarct, 8 had multiple small cerebral hemorrhages, 5 had a brain abscess, and 4 an aneurysm of the circle of Willis, the latter anomaly, interestingly enough, being found only in those patients exhibiting coarctation of the aorta.[14] Paradoxical embolism, the risk of subacute bacterial endocarditis, the pres-

ence of polycythemia, and perhaps common hereditary factors involving brain and heart are all of importance in bringing about a high incidence of central nervous system complications in this particular group of patients.

Febrile Convulsions

We now come to a consideration of the subject of febrile convulsions. Without doubt the "fever spasm" is the most frequent central nervous system "disorder" seen in infants and children, current estimates indicating that 2.5 per cent of the child population experiences one or more such episodes.[15] The occurrence of a convulsion at the onset, or less commonly, during the course of what appears to be a relatively benign febrile disease is always a cause for concern on the part of both parent and physician. One of the most interesting features of this condition is the age distribution indicating a marked predilection for the preschool child, a low incidence for young infants, and the virtual absence of febrile convulsions in the older child and adult. Acute infections, it is true, are most commonly encountered in the age group exhibiting the highest incidence of febrile convulsions. In support of the hypothesis that age plays a genuine role in determining susceptibility to febrile convulsions, the following observations in patients with bacteriologically proved shigellosis are offered (table 2).

TABLE 2

SHIGELLOSIS

(Incidence of Convulsions)

AGE	CASES *(number)*	PER CENT SHOWING CONVULSIONS
0-6 months	18	0
6-12 months	22	9
1-2 years	20	30
2-5 years	21	19
6-10 years	11	18
11 + years	21	0

Compilation of all patients admitted to the Children's Medical Center and City-County Hospital, Dallas, Texas, for the years 1949 to 1952. (Data collected by Dr. T. Williford and the author.)

Two theories have been offered to explain the pathogenesis of febrile convulsions: first, that the convulsion is equivalent to a "chill" in the adult and that the episode is of little consequence; second, the mere fact that the individual has sustained a convulsion under circumstances in which most exhibit no convulsive activity, indicates a constitutional or acquired predisposition. From the practical standpoint, when faced with the immediate problem of discussing the matter of prognosis with parents, one is never unduly pessimistic, yet it is of the utmost importance to realize that the proponents of the second of the two theories mentioned have the weight of modern evidence in their favor. Too much emphasis cannot be placed on the objective of a thorough investigation—history, physical examination and indicated laboratory procedures—of all patients exhibiting febrile convulsions. Note should be taken of the fact that children with neurologic deficit, for example, mongols and spastics, have a tendency to exhibit febrile convulsions more frequently than normal children.

With respect to the first theory, it must be noted that most patients having febrile convulsions do not have trouble later in life, and that the usual febrile response to disease is more pronounced in childhood than in adult life. Wegman's kitten experiments are widely quoted in support of the "benign theory," for this author found that the frequency of induced febrile convulsions in this species was correlated with the rapidity of temperature elevation and the immaturity of the animal.[16]

In support of the second theory it may be stated that about 5 per cent of children who sustain a febrile convulsion develop epilepsy in early life,[15] and that epilepsy is even more likely to eventuate when the febrile convulsion is severe, or focal in nature, or tends to recur. The proportion of febrile "convulsers" with abnormal electro-encephalographic records is higher than that in the normal population. Personal observation in a convulsive clinic for children has convinced me of the frequency with which a family history of convulsions or epilepsy is obtained. Lennox noted that 9.6 per cent of the near relatives (parents

and siblings) in his series were epileptic, and concluded his review of the subject of febrile convulsions with the words:

> If we accept the view that evidence of hereditary transmission is the hall-mark of essential epilepsy, then a febrile seizure is epilepsy; but more than that, it is an unusually pure culture of epilepsy.

Yet he realizes that the majority of these children remain seizure-free in later life and ends his discussion with an optimistic note:

> This conclusion has a corollary . . . the more pure or essential the epilepsy, the better the outlook for spontaneous recovery. Seizures uncomplicated by some acquired pathology of the brain tend to be short lived, perhaps even self-limited—limited by the stabilizing influence of age.[15]

Certainly the reactiveness of the central nervous system should be taken into account in any consideration of systemic disease, and advantage taken of any means at hand for prevention of complications involving this vital organ system.

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A BALANCED DIET

TAKE this business of nutrition that we hear so much about. Science is slowly discovering why it is that a mixed diet, containing food that has not been too much tampered with in its preparation, makes for health, and why a diet that is not sufficiently mixed, or does not contain enough fresh food, makes for ill health. It is because foods that are "body builders," "body protectors" and "body workers and warmers" are all represented in the mixed diet, and some of them are absent, or are only present in a too small degree, in the "deficiency" diets. In other words, those of our ancestors who were healthy ate what is now called a "balanced" diet without knowing it.

LORD HORDER

GENERAL PRACTICE *Review*

This department offers the latest, proved methods for the treatment and management of commonly encountered conditions based on the extensive experience of the physicians who prepare these summaries for POSTGRADUATE MEDICINE.

Functional Heart Disease

EDGAR DURBIN

Denver, Colorado

FUNCTIONAL heart disease is the most frequent type of heart disease and is very difficult to treat. This difficulty arises partially because many doctors neither understand the disease nor take time to treat it.

EDGAR DURBIN

The symptoms of functional heart disease are similar to those of organic heart disease and may be engrafted on them. Dyspnea, palpitation and precordial pain, especially, are complaints common to both classes of disease. The signs, also, are common to both functional and organic diseases. Tachycardia, arrhythmias, change in blood pressure, tachypnea and cyanosis of the extremities are all abnormalities that make differentiation difficult.

In general, the patient with functional heart disease is just as worried about his symptoms as the patient with organic heart disease. In fact, the former may be unduly worried about the symptoms and so help the doctor to make a diagnosis. On the other hand, the presence of organic heart disease may be overlooked because of the prominence of the functional element in the symptomatology. Careful evaluation of the whole picture is essential to proper diagnosis and treatment.

Functional heart disease occurs in the weak and in the strong. Some persons are more nervous than others, react in abnormal ways, and are termed psychoneurotics. Some individuals also are by both constitution and training physically weaker than others. Into this category falls the group referred to until recent years by the terms: soldier's heart, DAH—disordered action of the heart, neurocirculatory asthenia, effort syndrome, and cortico-hypothalamic imbalance.

Dr. Henry Hartshorne,[1] attending surgeon with McClellan's Army of the Potomac, described "muscular exhaustion of the heart" in 1863. DaCosta[2,3] later described the symptomatology which bore his name. Exercise intolerance was noted again in the Crimean,

South African and Indian wars. Extensive studies were made by Lewis,[4-6] Parkinson,[7,8] Parkinson and Drury,[9] Meakins,[10,11] Oppenheimer and Rothschild,[12] Cohn,[13] Brooks,[14] and many others in World War I. The terms "irritable heart," "soldier's heart," "effort syndrome" and "neurocirculatory asthenia" were used to describe the condition. In the first four years of World War II many excellent articles[15-33] were published, most of them stressing the psychoneurotic element in the syndrome. In 1946, Friedman[34] concluded that there was a "cortico-hypothalamic imbalance," and described a hyperventilation test.

Symptoms and Signs

Shortness of breath, palpitation, fatigue, pain in the left side of the chest, and dizziness are the cardinal symptoms. Other symptoms include increased perspiration, nervousness, headaches, trembling, sighing, flushes, throbs, paresthesias, cramps, dryness of the mouth, faintness and fainting, insomnia, frequency, loss of appetite, vomiting and diarrhea.

The signs of neurocirculatory asthenia are as multitudinous and diagnostic as the symptoms. In fact, the *number* of signs and symptoms helps to make the diagnosis. The individual is anxious in appearance, and is reluctant and embarrassed in shaking hands. Even after waiting in a comfortable reception room and having time to "cool off," the subject is tense and nervous when entering the examiner's office. In military life, he gives the impression of being ready to "jump out of his skin." While being interviewed, he fidgets and twists his hands, and he doesn't want to be cheered up, nor to be put at ease. If the patient is seated on an examining table, his crooked elbow supported by the examiner who is applying the blood pressure band, his arm will be stiff and will remain in the air if the support is removed. This tenseness of the arm exists in most cases of neurocirculatory asthenia; it has not been observed by the author in other conditions.[35] Temporary elevation of the blood pressure, tachycardia and signs of an overactive heart are to be expected on physical examination. Other signs are "past pointing" with the eyes, tremor of fingers and tongue, cold, wet, purple hands, excessive axillary perspiration, dermatographia, and hyperreflexia.

Lewis[6] pointed out the ease and practicability of gauging a patient's heart function by exercising him and observing his reactions. Hopping is a form of exercise that most people can perform without discomfort, and it can be done anywhere. The normal response to 50 vigorous hops is for the pulse rate to accelerate very little (4 to 30 beats per minute) and to decelerate very rapidly, being slower at the end of two minutes than the pre-exercise rate. In neurocirculatory asthenia this is not true; the acceleration is excessive (as much as 50 beats per minute) and prolonged; the pre-exercise rate is not reached at the end of two minutes of rest.

The diagnosis can be made from the history and physical examination or, in most cases by either alone. Laboratory procedures help but little. Teleoroentgenography demonstrates a heart of normal shape, but usually fairly small. Electrocardiography is negative except for prominent P waves in addition to the tachycardia. Craig and White[36] had eight patients with diphasic T in lead II and inverted T in lead III.

It is apparent that psychiatric conditions play a big part in the total picture of effort syndrome or neurocirculatory asthenia. This factor is not often noticeable except during total mobilization when persons of all types are called up, and an attempt is made to fit them into relatively few, but mostly strenuous, patterns of activity. We will understand neurocirculatory asthenia better if we consider the condition one of physical incompetence—the degree of which varies with heredity—environmental trauma, and recovery from illness. The milder forms can be treated by reassurance, encouragement and physical training. The marked type is a problem for psychiatrists to handle.

Another class of patients with functional heart disease are those with cardiac neurosis. These patients may overlap the neurocirculatory asthenia classification, or they may, under certain circumstances, be of the robust, very athletic type.

Cardiac neuroses arise because of such symptoms as palpitation, tachycardia and pain in the chest occurring in individuals who do not understand their significance and suffer recurrences for varying periods of time before receiving competent medical advice. Exercise is avoided because of the belief that heart disease is present and made worse by exercise. Physical constitutional inadequacy aggravates the symptoms.

The feeling of uncertainty, of insecurity, is one of the worst banes of man's existence. The uncertainty regarding a very vital organ—the organ that accounts for more deaths per year than any other—leads to an anxiety that produces symptoms which increase in severity as time goes on. If not allayed by well-grounded assurance, this anxiety and its attendant symptoms become firmly fixed and more difficult to eradicate. This insecurity may come dramatically to a previously healthy, robust individual who has a myocardial infarction and is put into a noisy, breezy oxygen tent through whose walls it is difficult to distinguish the significance of medical jargon, head shaking and therapeutic direction.

Treatment must be directed not only to the heart muscle but also to the entire patient. Unless his rehabilitation is started in the first few days of his acute illness, many cardiac symptoms caused by anxiety will occur and may become disabling.

A sizable proportion of functional heart disease is incident to the occurrence of arrhythmias. In nervous, susceptible individuals, the premature systoles that are unnoticed by most persons, cause alarming sensations of the heart turning over, the heart stopping, a big lump in the throat, or difficulty in getting a deep breath. The strangeness of the sensation, coupled with the uncertainty of its significance, make its occurrence doubly uncomfortable. Repeated episodes become more frightening and impress the patient with a sense of dissolution. Brief assurances of health, without sufficient explanation of the reason for symptoms, lead only to the feeling that a hurried doctor has been less than thorough in his analysis of the trouble.

Paroxysmal tachycardias, more commonly of auricular etiology, are less frequent than premature systoles, but they are more startling in their effect on the patient. Nervousness, fullness in the throat, precordial discomfort, breathlessness, weakness and a consciousness of the heart racing give no security to the unhappy individual. Only the experience of many attacks gives assurance that they are very uncomfortable, but that they can be tolerated and lived through.

Similar to paroxysmal tachycardia and difficult to distinguish clinically is paroxysmal auricular flutter with regular 2:1 ventricular response. Fortunately, from the therapeutic point of view, it occurs much less frequently.

Intermediate in occurrence is paroxysmal auricular fibrillation which may exist in very short runs or may persist for hours and days—even in the absence of organic heart disease. The irregularity usually adds to the discomfort of the palpitation.

Very few in the general population realize that there are over 20 types of heart disease. Many people believe that anything connected with the heart means sudden death or a miserable period of survival. A pain in the chest, reaching for air, irregularities, hearing the pulse, feeling the precordial impulse—all center attention on the heart with a fear based on lack of understanding. The prognosis of arteriosclerotic coronary artery disease at its worst becomes the outlook for any type of heart disease. The symptoms of breathlessness are connected with heart failure and the bugaboo of bedridden dropsy. This lack of differentiation in medically untrained minds leads to anxiety and an augmentation of symptoms. The longer the duration of symptoms, the more vicious the circle becomes.

Diagnosis

The diagnosis of functional heart disease should be made on the basis of a thorough, painstaking history, corroborated by an unhurried, complete physical examination and supplemented by laboratory procedures, such as electrocardiography, teleoroentgenography, blood studies, and urinalysis. Other procedures may be necessary at times.

Of primary importance is the setting of the

initial symptom or symptoms. When did the patient notice the trouble? Where was he? What was he doing? What was his reaction? Did he interrupt what he was doing or continue? What was his thought regarding the happening? Were there any attendant symptoms? How long did the symptoms last? Did they recur? When next, and under what circumstances? When was medical attention sought? What was done? What did the doctor say? How has the patient been living since then? Was a restriction in activity advised or spontaneously arrived at? What medication has been taken, with what results?

Quite often, on completion of the history, it is appropriate to remark that anxiety, fatigue from overwork and lack of sleep might account for all the symptoms.

Following this detailed history, it is important to make a thorough examination. Of course, it is essential to detect any organic disease, but it is equally important to bolster the individual's confidence in his doctor by doing a fine job. An indifferent, hurried examination can ruin the doctor-patient relationship and nullify the advantage of a good history. The seeming drudgery of a routine physical examination—quite often when other things seem to press hard on one's attention—must be put into the background of thought and the habits learned in medical school brought into play. The patient should feel that he has had the doctor's full attention and talents. This is the background for reception of diagnosis, prognosis and therapy.

It is well to remember that in the individual with functional heart disease, there is no certain set of signs that is diagnostic. The heart may be overactive, giving rise to tachycardia, relatively loud sounds, apical systolic murmurs (even of grade three intensity), and elevated systolic and pulse pressures. Other signs in favor of, but not diagnostic of uncomplicated functional heart disease are clammy hands, axillary drip, muscle tension, dermatographia and a poor response to exercise. These latter signs occur only with the more severe types of cardiac neurosis.

It is important to supplement the history and physical examination with special procedures. They are useful in discovering unsuspected disease, and are of considerable importance—if negative—in impressing the patient with the functional nature of his complaints.

An electrocardiogram is more useful if it includes 12 to 14 leads and is definitely more impressive to the patient. If any arrhythmia is present the tracing furnishes a means of graphically explaining the condition to the individual. If the arrhythmia was heard but not caught in the record, an electrocardiogram taken on another individual with the same condition will serve to explain the mechanism of the abnormality. Electrocardiograms serve to differentiate between paroxysmal tachycardia (auricular, nodal and ventricular) and auricular flutter; between auricular fibrillation and auricular flutter with a changing A-V block. Clinical acuity can be sharpened by study and practice, but the electrocardiogram gives a definite answer in most cases. Occasionally, an abnormal electrocardiogram is found in those with neurocirculatory asthenia or cardiac neurosis. The mechanism is not understood, and neither is the reason for the abolition of the abnormalities by the intravenous administration of dihydroergocornine (DHO-180), which has been studied by Master and associates[37] in hundreds of cases.

Of interest to the doctor is the size of the patient's heart which can be determined satisfactorily by fluoroscopic examination. Orthodiagraphy or teleoroentgenography, on the other hand, furnish a record which is of use not only immediately but also in the future. The progression of disease, or the lack of progression, are of importance in the direction of a person's activities.

Very frequently, especially in asthenic women, a slight to moderate anemia may augment the tachycardia, palpitation, shortness of breath, giddiness and weakness that are present. A routine blood test will detect this fault, and iron therapy will serve to augment the psychotherapy of explanation, assurance and increased daily exercise.

Treatment

The first step in treatment is to tell the patient what is wrong with him. Usually this

can be done fairly directly. Occasionally, it is better to explain the condition without naming it. It is then important to point out that there are many types of heart disease and that they do not all act the same way, nor are their prognoses the same. If organic heart disease is present, it should be so stated, and the symptoms due to it should be separated from those due to psychogenic factors. This enables the patient to adjust his thinking and will form a basis for eradicating a sizable portion of the symptomatology. It will give the individual an idea of his therapeutic problem and make cooperation easier.

I remember the case of a 55 year old victim of a heart attack. Formerly an oil field worker, he had had a myocardial infarction three years before and had subsequently had a cerebral episode from which he recovered. However, because of chest pain—which on simple questioning seemed to occur as often while at rest as during moderate activity—it had been decided that he had angina, that he was a poor risk for surgery, and that a herniotomy was to be denied him. This man had many work-years left despite his symptoms and despite his electrocardiogram which had marked residuals of an anterior myocardial infarction.

Mere dismissal of a patient's symptoms with a laugh and the comment, "You're all right!" or the advice, "Forget it," is not enough. The patient hates to feel that the doctor thinks he has imagined his complaints. Quite often, when the explanation of a patient's condition is half completed, he will say, "But Doctor, I did not imagine these!" It is important to explain that the symptoms were not imagined but are caused by a functional derangement of the nervous system. The factors of stress, anxiety and fatigue must be emphasized, and the way in which they influence the nervous system be pointed out to the surprised patient.

Much of a cardiologist's time is taken up by telling patients what they can and cannot do. The longer a person has suffered under the illusion that he has heart disease, that all his symptoms are due to that heart disease, and that it may disable or kill him at any time, the more time the doctor has to spend assuring him of his real condition and persuading him to lead a fairly normal life. A large part of the treatment of a cardiac patient or of a person who has symptoms referrable to the heart must consist of specific directions on how to live. The longer a person has believed he had heart disease and has misunderstood its prognosis, the more restricted have become his activities. Again, I wish to repeat that the symptoms of heart disease must be separated from the secondary symptoms of anxiety, and a differentiation must be made to the patient.

Self-restricted activity must be abolished. It should not be done precipitously, however, lest the work-intolerance of weeks to years cause a recurrence of symptoms when the individual rushes into unaccustomed exercise. Instead, there should be a gradual increase in the amount of work performed. Small amounts of exercise should be engaged in and be repeated after rest. Steadily, the length of the exercise—and walking is a very easy exercise to control—is increased and the periods of rest decreased. The patient must "go into training." To superintend this training properly, it is necessary for the doctor to see the patient often enough to encourage and guide, to answer questions, and to give advice. Weekly conferences give way to less frequent visits as the individual gains strength and confidence. Finally, the patient can be discharged except for examinations every year or two.

It is important to give the proper advice regarding work. The individual's attributes, education, training, ambitions and work experience must be considered in suggesting the right job.

Not all of the treatment of functional heart disease is psychotherapy. The patient has sought medical attention in order to get relief from bothersome symptoms. An explanation of the symptoms is not quite enough. The patient will try to grasp the doctor's verdict and directions, but will forget part of the story—particularly when some of the symptoms persist. Sedatives should be used as a crutch, to support the patient temporarily

until strength returns. Prescription of one-quarter to one-half grain of phenobarbital three to five times a day decreases tension, lessens anxiety and makes the transitional period more bearable. It ensures a good night's rest, particularly if supplemented by one of the quicker acting hypnotics at bedtime. If the symptomatology is due partly to intestinal irritability and gaseous distention, prescription of one of the antispasmodics may be very helpful. Relief of the left chest discomfort will make the patient feel that confidence in the doctor was justified and strengthen his determination to follow orders even to the point of taking exercise. For some persons, coffee, tea and cola drinks are poison and should be discontinued. Reduction of sweating, hyperperistalsis and "jitteriness" will do much to calm the anxious patient.

To reduce heart consciousness in the moderately or severely anxious patient, arrhythmias should be treated. Premature systoles may respond to quinidine sulphate (3 gr., three times a day) or procaine amide hydrochloride (250 mg., four times a day). Sometimes the frequency of dosage will have to be increased to six times a day. The prophylaxis of paroxysmal tachycardia, auricular fibrillation or flutter is quite often effected by a daily dosage of 3 gr. of quinidine sulfate three or four times a day. Digitalis may be tried if quinidine is not successful.

A sense of well-being and loss of fatigue may be imparted by the prescription of several small doses (5 mg.) of amphetamine per day. Other tonics are useful and should be prescribed, depending on the indications for dietary supplementation and on the patient's tolerance for alcohol.

Summary

I shall conclude by reiterating that the diagnosis of functional heart disease is an important part of the practice of medicine. It rests on the recognition of a certain set of symptoms, occurring singly or more frequently in profusion, and the correlation of these symptoms with physical signs. Both diagnosis and successful treatment of the condition should be based on a thorough history, physical examination and supplementary procedures which should include fluoroscopy or teleoroentgenography, electrocardiography and blood and urine examinations. If all of this is done soon after the onset of symptoms, treatment will be more successful.

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Obstetric Analgesia and Anesthesia: Practical Aspects

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The ideal of the obstetric anesthesiologist is to assist the able obstetrician in bringing every gravid woman safely and comfortably through her labor, delivery and postpartum period with a living and healthy baby. This ideal requires that physicians receive adequate training and experience in the fundamentals of both anesthesia and obstetrics.[1]

The reduction of maternal and fetal morbidity and mortality from obstetric analgesic and anesthetic causes can be achieved only by the combined efforts of the obstetrician, the anesthesiologist, the pediatrician, the hospital administrator and their associates. Obstetric analgesic and anesthetic causes constitute 5 to 20 per cent of the various recent maternal mortality reports. The percentile of fetal and neonatal mortality from these same causes is considerably higher. These data give us some idea of the importance of the problem when we realize that the mortality causes in most of these instances are preventable.

The statement has been made that "The maternal mortality problem in the United States is . . . one for local action in those areas in which maternal mortality rates are still relatively high."[2] The chief causes of obstetric mortality and morbidity are toxemia, hemorrhage and frequent use of high forceps, as well as other operative trauma, infection, poor preparation of the pregnant patient for labor and delivery, and poor obstetric anesthesia. The challenge of making the period of childbirth safer for mother and baby exists for all interested physicians. The development of better obstetric analgesia and anesthesia has contributed greatly to more conservative management of labor and delivery.

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In spite of some reports to the contrary, labor and delivery are painful experiences for most mothers. This has been recognized by most physicians since the earliest origins of medical practice.

The intensity and severity of the pain increase as labor progresses, reaching maximal pain during the second stage of labor and the delivery period. There are many factors that can intensify the mother's painful experience during labor. Emotional instability, anxiety, fear, hyperthyroidism, fever, sthenia and other causes intensify pain perception and pain reaction even in the presence of skin infiltration over the areas of referred hyperalgesia.

An artful physician will exercise every effort and skill to develop confidence in the parturient patient. Certain preposterous notions entertained by some practitioners should be clarified at this point. One is that labor is painful, but that the pain is necessary for the mind and soul of the mother. The other is that fear is the cause of the pain experienced by the obstetric patient. The contenders of these ridiculous notions would have us return to the practice of some primitive form of obstetrics and anesthesia.

The modern trend[3] is to reassure the mother that proper skill and judgment will be exercised by the members of the obstetric team to provide her with pain-relief consistent with safety for both mother and infant. We, at the Boston Lying-In Hospital, function on the premise that there is no ideal method which provides complete pain-relief for all patients during parturition. The obstetrician, in cooperation with the anesthesiologist, determines the time and the type of obstetric anesthesia for delivery before selecting preanesthetic agents. The prospective mother is evaluated "anesthetically" as well as "obstetrically."

Obstetric analgesia includes the drugs and procedures selected for preanesthetic medication during labor. Obstetric anesthesia refers to the agents and technics of administration for the production of anesthesia during delivery. These phases should constitute an integrated plan of approach for each obstetric patient. Overdosage and misuse of obstetric analgesic drugs during labor may be just as productive of ill-effects as is improperly administered obstetric anesthesia. There is a healthy trend away from the use of massive repeated doses of central nervous system depressants during labor.

Criteria for Selection

The selection of analgesic drugs, anesthetic agents and technics for the obstetric patient essentially will depend on the following four considerations:

1. The prospective mother and the problem that she and her baby present. The nature of any complication that may exist and its proper evaluation.
2. The obstetrician's personality, including his temperament, skill and judgment.
3. The experience, judgment and alertness of the anesthesiologist.
4. The environment in which the labor and the delivery are being conducted.
5. The availability of adequate professional assistance.

It should be emphasized at this point that the safety factors under consideration depend not so much on the agents and procedures used as on the abilities and mutual confidence of members of the obstetric team.

Requirements of Anesthesiologist

Essentially the anesthesiologist will be influenced in his selection of obstetric analgesia and anesthesia by the following considerations:[4]

1. The availability of adequate pharmacologic agents and equipment, including adjustable delivery tables for all required positions as well as properly functioning suction facilities.
2. The practical considerations of the environment for safe and controllable pain-relief.
3. The availability of proper personnel for induction of unconsciousness and the recovery periods.
4. The obstetrician's requirements for muscle-relaxation during delivery.
5. The possible occurrence of side effects

and undesirable reactions incidental to the administration of any pharmacologic agent during labor.

6. The retrievability of the agent and its likelihood of moment-to-moment control.

7. The requirements of psychic sedation and the degree of pain-relief consistent with safety to the mother. Our most successful methods of obstetric analgesia have included the production of amnesia with the use of scopolamine.

8. The maternal and fetal complications presented by the particular parturient patient.

9. The practical requirements for a rapid, pleasant induction and controllable maintenance of anesthesia for the delivery.

10. The practical considerations for a pleasant emergence of the mother devoid of hazards for both the mother and her baby.

Experience teaches the prudent physician the futility of trying to standardize obstetric analgesia and anesthesia to fit all obstetric patients. The selection of obstetric analgesic agents during labor should be correlated with the choice of agent and technic to be employed during delivery. The dose, route and timing of administration of the selected pharmacologic agents are of importance. It may seem paradoxical, but the deeper the anesthetic requirements necessitated by the obstetric procedure, the lighter the preanesthetic medication should be.

A brief but practical outline of the management of the uncomplicated patient to be delivered vaginally will be considered and be followed by a discussion of the management of the patient presenting a complication.

Uncomplicated Vaginal Delivery

During labor, administer a rapidly acting barbiturate, e.g., SECONAL® sodium, 1½ gr. (100 mg.), orally or rectally, early in labor. The purposes of this medication are to determine the patient's sensitivity to the barbiturates and to provide psychic sedation. If sensitivity is known to exist, another hypnotic agent is used. The barbiturates have additional functions in obstetric analgesia.[3]

About an hour later, or as soon as painful labor is established, administer 1½ gr. (100 mg.) Seconal sodium and 3 gr. (180 mg.) AMYTAL® sodium. No additional increments of barbiturates are to be administered during the remainder of the course of labor.

About a half hour later, administer scopolamine hydrobromide and apomorphine hydrochloride, 1/100 gr. (0.6 mg.) of each.[5]

At the end of another hour and every two hours thereafter until the time of delivery, the following agents are administered:[5] 1/150 gr. (0.45 mg.) scopolamine hydrobromide and 1/50 gr. (1 mg.) apomorphine hydrochloride. The intramuscular route is employed for the parenteral administration of agents unless otherwise specified.

During delivery, the obstetric anesthesia of choice is the inhalation procedure employing the nitrous oxide-oxygen-ether sequence by the closed carbon dioxide absorption technic. Emphasis is placed on constantly maintaining a clear, unobstructed airway with an oxygen-enriched atmosphere prior to the actual birth of the baby. At the completion of the anesthesia and delivery, the mother is turned on her side with constant supervision during the relatively short recovery period.

Management of Complications

Central nervous system complications—These include known or suspected diseases of the central nervous system, e.g., tumors, hemorrhage, lesions of the brain or spinal cord and their coverings; history of headache; history of difficulty associated with a previous regional anesthesia.

During labor, management of the patient is essentially the same as for the normal patient.

During delivery, the inhalation procedure using highly-oxygenated atmospheres is followed.

Respiratory system complications—If there is active respiratory infection with fever or cough during labor, use the same medication as for the uncomplicated cases, but reduce the dosage of barbiturates.

During delivery, premedication is used either alone or supplemented by a regional anesthetic block, e.g., pudendal, field or low spinal block.

If there has been a previous thoracic operative procedure with reduced pulmonary function, or if active tuberculosis is present, follow the procedure for obstetric analgesia and anesthesia as in the case of active respiratory infection.

When asthma, without other complications, is present during labor, reduce barbiturates, and proceed with scopolamine and apomorphine medication.

During delivery, use inhalation anesthesia with ether as the agent of choice. It is good clinical practice to screen a potentially allergic individual by skin-testing procedures.

Cardiocirculatory complications—For the unfavorable cardiac patient, individualize the premedication and the anesthetic procedure. During labor, administer 50 to 100 mg. DEMEROL® hydrochloride subcutaneously with onset of active labor; repeat every three to four hours as indicated. Administer atropine in one dose of 0.45 to 0.6 mg. intramuscularly a half hour before anesthesia. Do not give repeated doses of scopolamine to the pregnant cardiac patient.

During delivery, use inhalation anesthesia with oxygen-enriched atmospheres. Continue with oxygen insufflation in the postpartum period until the pulse rate is well stabilized.

For the favorable cardiac patient, follow essentially the same regimen.

The functional cardiac patient can be managed in the same way as any patient with no complications.

Genitourinary complications—If there is mild to moderate impairment of renal function, use half the usual doses of medication during labor, and employ inhalation anesthesia for delivery.

In the case of advanced (severe) impairment of renal function, treatment during labor must be individualized and for delivery, follow a regional anesthetic procedure with supplemental oxygen administration.

Gastrointestinal complications—If the patient has ingested food within six hours of the onset of labor, an attempt may be made in selected cases to empty the stomach by the use of apomorphine hydrochloride, 1/50 gr. (1 mg.). If successful, proceed as for a normal case. If such treatment is inadequate, or delivery is imminent, maintain consciousness in the patient, and apply a regional analgesic block.

Patients requiring abdominal and other surgical intervention during pregnancy are treated on an individual basis with regard to anesthesia.

During labor, patients are not permitted ingestion of any food or fluid by mouth. The parenteral administration of fluid therapy is maintained as indicated.

Metabolic complications—If diabetes mellitus is present but is well controlled medically, obstetric analgesia and anesthesia are applied as for an uncomplicated case. If, however, diabetes mellitus is present but uncontrolled medically, during labor reduce the dosage of the analgesic and amnesic agents to half or less with the object of maintaining consciousness in the patient. During delivery, select an appropriate regional anesthesia.

If hyperthyroidism is present, the obstetric analgesic agents used during labor are the same as for an uncomplicated case, but it may be necessary to increase the dosage and vary the timing. During delivery, an inhalation procedure is selected with emphasis on providing highly oxygenated atmospheres.

Fetal complications—With patients presenting the problem of prematurity or postmaturity of the fetus, the degree of this complication will be the primary influencing factor. During labor, individualize as to drug, dosage, route and timing of administration. Generally, the minimal dose of the least depressant agent is combined with a parasympathetic blocking agent, e.g., Seconal sodium, ½ gr. to 1½ gr. (30 mg. to 90 mg.) and scopolamine hydrobromide 1/200 to 1/150 gr. (0.3 to 0.45 mg.). Regional anesthetic procedure is used during delivery for the greater degrees of this complication; otherwise, inhalation anesthesia.

For patients with a rising titer of Rh antigens, where the baby is to have one or more replacement transfusions, administer one-eighth to one-fourth of the drug and dose selected for an uncomplicated case while maintaining consciousness in the mother.

During delivery, a regional anesthetic procedure is the method usually selected.

Specific obstetric complications—If the patient is to have cesarean section or a double set-up examination, the premedication used comprises 1½ to 3 gr. Seconal sodium (or its equivalent) administered two hours preoperatively and 1/100 (0.6 mg.) scopolamine hydrobromide given intramuscularly one hour later. Inhalation anesthetic procedure is preferred, but a regional procedure may be followed under special conditions.

If the patient is to have a test of labor, follow the same regimen during labor as for an uncomplicated case, but reduce the dosage of medication. Inhalation procedure is the method of choice for delivery. For the patient with prolonged and difficult labor who presents a difficult vaginal delivery, decrease the premedicating agents as the time of delivery approaches, and use a regional anesthetic procedure, usually a low spinal block, for delivery. Oxygen insufflation may be used as supportive therapy. Venocylsis is established ordinarily and the facilities for transfusion should be at hand.

For the patient presenting the problem of toxemia or pre-eclampsia, the obstetric analgesic and anesthetic approach will be influenced by the severity of the pre-eclampsia. Ordinarily, the mildly pre-eclamptic patient would be treated anesthetically as outlined for an uncomplicated case. The more severe grades of pre-eclamptic patients would be approached as follows:

During labor, medication is individualized because the patient will already have received, ordinarily, magnesium sulfate, barbiturates or some other central nervous system depressant. This may be sufficient for obstetric analgesia; otherwise, administer 50 to 100 mg. of Demerol and 0.6 mg. atropine sulfate intramuscularly about one hour before the expected time of delivery. Frequently, the medication employed during labor proves adequate to complete the delivery. If additional depth of anesthesia is required, resort is usually made to inhalation anesthesia with oxygen-enriched atmospheres. Regional anesthesia is employed in selected cases.

Regional Analgesia

By regional analgesia, or anesthesia, we mean to convey the use of a noninhalation procedure,[1] such as pudendal block, spinal block in its several forms,[4] field block and other methods. When spinal subdural analgesic block is selected, we base our choice on the presence of one or more of the following indications:

1. The patient has recently (within six hours) ingested a full meal, and gastric retention of food is suspected. Food or fluids by mouth are not permitted during labor for our hospitalized patients.
2. The patient presents the problem of prematurity or true postmaturity.
3. The patient presents the problem of a rising titer of Rh antigens, and the baby is to receive one or more replacement transfusions soon after delivery.
4. The patient presents the complication of an active respiratory infection.
5. The uncontrolled diabetic patient.
6. The patient presents the problem of marked impairment of renal function.
7. The patient presents the problem of marked impairment of hepatic function, particularly when retention of consciousness is a concomitant indication.
8. The patient presents some special obstetric problem such as a prolonged, difficult labor to be followed by a difficult delivery.

The guiding principle in management of regional anesthesia is that the benefits to be derived for mother and baby should outweigh the immediate and late complications that may follow use of spinal anesthesia for the obstetric patient. The agent of choice for most regional anesthetic procedures, including spinal anesthesia, is procaine hydrochloride. If a longer acting agent is preferred, the choice usually is PONTOCAINE® hydrochloride. The dose of the latter agent does not exceed 10 mg., and the agents injected never exceed a concentration of 5 per cent.

Inhalation Anesthesia

About 75 to 80 per cent of the deliveries at the Boston Lying-In Hospital are com-

pleted by employing an accepted inhalation anesthetic procedure. The agent of choice is diethyl ether in well-oxygenated atmospheres and usually administered by the closed carbon dioxide absorption technic. The depth of anesthesia during delivery is adjusted in accordance with the moment-to-moment requirements. An effort is made to maintain the mother at the first plane of the third stage (Guedel classification) during the actual delivery of the baby.

The advantages of the obstetric inhalation anesthetic approach may be summarized as follows:

1. Anesthesia by the inhalation route is predictable, certain and quite rapid.

2. Inhalation anesthesia provides greater flexibility of action.

3. This method of anesthesia alone provides the necessary moment-to-moment control of the depth of narcosis for the varied obstetric requirements.

4. The retrieval of the anesthetic agent is most readily accomplished by inhalation technics. Rapid exchange of anesthetic agents is permissible only by following this approach. Short induction and short recovery periods are possible.

5. Inhalation anesthetic agents do not undergo any essential chemical or physical changes in their passage through the body tissues. The effects of the agents, per se, on the mother and baby are, therefore, minimized by inhalation anesthesia.

6. This group of anesthetic agents is not dependent on rapid destruction by the body. They do not depend on hepatic or renal detoxification or elimination and so are of distinct advantage to the obstetric patient.

7. The inhalation anesthetic agents possess a wide margin of safety when properly used because of their lability of action, reversibility of effect, and lack of specific neurotoxic action. This is of distinct advantage in the practice of obstetric anesthesia.

8. Properly administered inhalation anesthetic procedures may be used over prolonged periods of time without serious residual influences on the mother or her baby.

9. This method permits the constant employment of highly oxygen-enriched atmospheres provided that the patency of the airways is scrupulously maintained.

10. The newborn infant is at a distinct advantage in eliminating volatile and gaseous agents from its tissues and blood stream due to its favorable differential in respiratory minute-volume.

11. Proper selection and skillful administration of inhalation agents in highly oxygenated atmospheres will convert an obstetric emergency to a problem which can be solved more deliberately without increased hazard for mother and baby.

12. Inhalation anesthesia is always the proverbial anesthetic "ace in the hole" for the obstetrician. When other anesthetic methods fail or when doubt exists as to their applicability, resort is always made to inhalation anesthetic procedures.

Resuscitation of the Newborn

Asphyxia neonatorum is due to several etiologic causes. The most important of these factors are developmental defects, birth injuries, intra-uterine hypoxial influences, analgesic and anesthetic drugs. Hypoxia, or oxygen deficiency, is the most devastating and yet the most preventable of all causes.

A rational plan of procedure and prompt timing for the resuscitative measures proves to be the most effective means of treating this complication. The first step is to quickly cleanse the nasopharynx and the airways of secretions and debris. The next step is to insufflate the newborn with an oxygen-enriched atmosphere of air with gentle, rhythmic intrapulmonary pressure of about 20 cm. of water pressure. The most effective results follow institution of these measures within the first 30 seconds of extra-uterine life of the baby.

The anesthetic factor is seldom significant if the hypoxial influence is promptly eliminated. The use of carbon dioxide in the treatment of asphyxia neonatorum may be harmful when hypoxia is not corrected promptly and effectively. Analeptics result in more harm than good, particularly in the presence of hypoxial states. The use of complicated mechanical resuscitative devices is of question-

able merit. The essential indications are the early establishment of automatic respiratory ventilation, adequate oxygenation of the arterial blood and conservation of body heat of the newborn. Time lost in achieving these prime objectives may never be regained.

Concluding Remarks

The contributions of modern anesthesia to the practice of better obstetrics are being increasingly recognized by well-informed physicians. The progress in safeguarding the prospective mother and her child is not reflected by the increase in numbers of pharmaceutical products but by the availability of the modern well-trained physician. Experience teaches the prudent physician the futility of standardizing obstetric analgesic and anesthetic practice to a routine for all patients. Modern developments in obstetrics and anesthesia emphasize the need of exercising alertness, judgment, skill and mutual confidence among the members of the obstetric team. The most critical period in the lives of the mother and her baby is during labor and delivery. Whether the physician is practicing alone or as a member of an obstetric team, it behooves him to safeguard the welfare of the mother and her baby during childbirth.

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MEETINGS *and Postgraduate Courses*

University of Kansas Medical Center, Kansas City, Kansas: Postgraduate course in pediatrics for pediatricians and general physicians, March 15-17, 1954. Guest instructors will be Dr. Russell J. Blattner, Baylor University College of Medicine; J. Russell Gallagher, Harvard Medical School; C. Everett Koop, University of Pennsylvania School of Medicine, and Robert J. Murphy, Kansas City, Missouri.

University of Minnesota, Minneapolis: Continuation course in eye, ear, nose and throat for general physicians, April 5-7, 1954 at the Center for Continuation Study. The course will be presented under the direction of Drs. L. R. Boies, clinical professor and head, department of ophthalmology and otolaryngology and Erling W. Hansen, clinical professor and director, division of ophthalmology, University of Minnesota.

University of Minnesota, Minneapolis: Continuation course in cardiovascular diseases for general physicians, at the Center for Continuation Study, March 22-24, 1954. Dr. Samuel A. Levine, clinical professor, Harvard University Medical School, Boston, will be guest lecturer and will also present the annual George E. Fahr Lecture on March 23. Sponsored jointly by the University and the Minnesota Heart Association, the course will be presented under the direction of Dr. C. J. Watson, professor and head, Department of Medicine, University of Minnesota Medical School.

University of Minnesota, Minneapolis: Continuation course in emergency surgery for general physicians, at the Center for Continuation Study, April 1-3, 1954. Faculty for the course will include Dr. J. Garrott Allen, professor of surgery, University of Chicago School of Medicine, who will also deliver the annual Clarence M. Jackson Lecture on the evening of April 1. The program will be presented under the direction of Dr. O. H. Wangensteen, professor and chairman, Department of Surgery, University of Minnesota Medical School.

Landmarks in Medicine

WARREN H. COLE*

University of Illinois College of Medicine, Chicago

Reference is made to the empiric methods of the practice of medicine in ancient times. Epidemics were rampant centuries ago; a few are discussed. Causes of death several decades ago are compared with causes of death today. The seriousness of accidental deaths, particularly those due to automobile accidents, is emphasized. A few social problems related to medicine are presented.

WARREN H. COLE

We are living in an age which has profited much indeed from the triumphs of medicine. This leads us to take much for granted—too much, in fact, for our own welfare. Accordingly, I think it is very good for our souls to review, now and then, a few pertinent historic milestones, some of which represent triumphs, but many of which represent tragedies of health and medicine.

Ancient Medicine

I need not remind you that medicine, as practiced centuries ago, was quite unscientific. What little progress there was apparently was made independently in various centers of civilization throughout the world. As long ago as 1000 to 2000 B.C., we find evidence that medicine was practiced as a specialty by the American Indians (especially the Aztecs), the Chinese, the Babylonians and numerous other groups of people.

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Dinner address, presented before the thirty-eighth annual Assembly of the Interstate Postgraduate Medical Association at Chicago.

Previous to 2000 and 1500 B.C., the profession had perhaps made its greatest strides in Babylonia, the center of the Chaldean civilization between the Euphrates and Tigris rivers in Iraq. This would appear logical since ancient history suggests civilization started here; thus, we might expect any science to have been most advanced in this area. However, we cannot call medicine as practiced then a science. It was based solely on empiric grounds, i.e., without any relationship to science. Numerous bronze surgical instruments (figure 1) have been found in the ruins of Babylonia and elsewhere, indicating surgical practice in this age. It appears that operations for bladder stones, trephining the skull and opening abscesses were the most common operations.

The physicians of Babylonia belonged to a certain caste and apparently were quite proud of their profession. They carried a bag containing bandages, instruments, liquid medicines, powders and pills. Some physicians had

FIGURE 1. Pompeian surgical instruments. (After Castiglioni.)

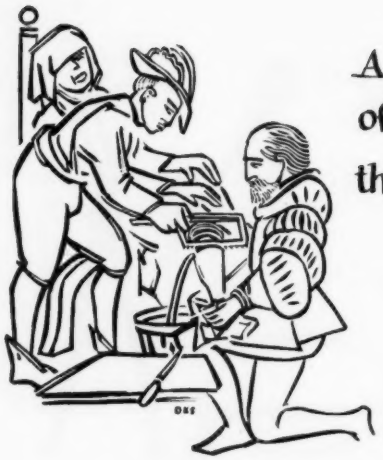
very elaborate seals. Their pride and, we should add, their commercial aspirations were convincingly expressed by the Code of Hammurabi, dated about 1900 B.C. The following quotation from Castiglioni[1] describes the full courage of the physician of that time, his desire to be fair with his patient, and his unjustifiable faith in his ability.

> Concerning the wounds resulting from operations it is written: "If a physician shall produce on anyone a severe wound with a bronze operating knife and cure him, or if he shall open an abscess with the operating knife and preserve the eye of the patient, he usually shall receive 10 shekels of silver; if it is a slave, his master shall usually pay two shekels of silver to the physician.
>
> "If a physician shall make a severe wound with an operating knife and kill him, or shall open an abscess with an operating knife and destroy the eye, his hands shall be cut off.
>
> "If a physician shall make a severe wound with a bronze operating knife on the slave of a free man and kill him, he shall replace the slave with another slave. If he shall open an abscess with a bronze operating knife and destroy the eye, he shall pay the half of the value of the slave.
>
> "If a physician shall cure a diseased bone or a diseased organ, he shall receive five shekels of silver; if it is a matter of a freed slave, he shall pay three shekels of silver but if a slave, then the master of the slave shall give to the physician two shekels of silver."

It seems logical to predict that Babylonian medicine might have progressed into a scientific phase, but barbarians conquered the country about 700 B.C. and the Babylonian civilization was destroyed.

As intimated previously, medicine practiced in that era was purely empiric, which in most communities led to the practice of magic. Ideas about magic were innumerable. Apparently the goal was to triumph over bad demons or to pacify angry spirits. Amulets representing various types of objects were worn to keep away disease. But we should not laugh at these customs. How many in this room remember the days when a bag of asafetida was tied around the necks of children to prevent development of measles, scarlet fever, acute tonsillitis, etc.? I consider myself fairly young, but when I was about five years old my grandmother tied a bag of asafetida around my neck, where it remained for two or more weeks during an acute respiratory epidemic. I remember distinctly that I escaped contracting the infection during the time I was wearing it, because every time I protested continuation of the treatment (which I assure you was far from fragrant), my grandmother reminded me that I was entirely well. After all, surely no self-respecting bacteria would linger long around a person carrying such a penetrating, repulsive, everlasting odor. I remember that stench just as vividly as though I had worn that bag of asafetida yesterday.

Scarification of the lips, tongue and ears was often part of a ritual to protect against the evil spirits of disease.



A barber surgeon of the 1500's amputating the leg of a patient FIGURE 2.

Many drugs and herbs were developed by the American Indian. One historian lists 144 drugs used by the Indians; 59 of these are listed in our modern pharmacopoeia. Thus, we recognize that at the bottom of many magic customs, a grain of truth exists. A good example of this is the use of curare, although the drug was used by the Indians more in hunting to paralyze game hit by "poisoned" arrows. Those Indians knew about scopolamine (obtained from the jimson weed), laxatives, emetics, carminatives, antispasmodics, etc. No wonder the Indian medicine man was such a powerful and influential figure. Although he may not have cured many of his patients, at least he was able to give them something having a strong pharmacologic action.

The Aztecs were very skillful in the use of surgical instruments made of stone. Trephining of the skull was practiced by them and by many other different groups of people. Some practices involved bloodletting because blood was recognized as necessary for life. Unfortunately, this ritual got completely out of hand, based possibly on the supposition that if the sacrifice of a little blood pleased the gods, the sacrifice of a large amount would please them still more. Thus was born the custom of sacrificing a human being, usually some beautiful young maiden; strange to say, this custom developed spontaneously in several parts of the world.

It was not until the time of Hippocrates, who was born 460 B.C. on the island of Cos off the coast of Asia Minor (now Turkey), that medicine began to assume a scientific character. Hippocrates originated the science of investigation and observation. He established the fact that disease was a natural process and that symptoms were reactions to body disease. He wrote many books; his descriptions of many diseases were so accurate that they could compare favorably with many case histories written today. Very rightly he is called the "Father of Medicine." His pupils carried on his teaching in a feeble manner but without significant progress.

About 500 years after Hippocrates' birth (138 A.D., to be exact) another brilliant man was born. I refer to Galen of Pergamum in Asia Minor, though he spent most of his time in Rome. If he had had Hippocrates' honesty he might have contributed even more than Hippocrates himself. However, Galen's dishonesty prevented this. Half the moments of his life were devoted to scheming how he could impress his patients and belittle his competitors. He preferred to attribute to magic the results of medical science, and practiced so many lies that he must finally have believed them himself.

Early Development of Surgery

After the period of Galen, centuries passed without any significant progress in medicine. The anatomic discoveries of Vesalius (1514-1564) laid the foundation for great advances, particularly in surgery, but they were slow in forthcoming (figures 2 and 3). At about this time (1536) a very important surgical discovery was made by a French surgeon named Ambroïse Paré. For decades, and even cen-

turies, it had been the practice of military surgeons to pour boiling oil into soldiers' wounds. One day, during the battle of Danvilliers, Paré found the supply of oil exhausted. Instead of controlling the hemorrhage with burning oil, he used ligatures to tie the vessels and applied a simple dressing. During the following days he discovered that the wound was free of the terrible necrosis and suppuration so commonly seen, and the patient was comfortable. Ligatures for bleeding vessels had been used previously, but Paré popularized them so much that he receives the credit for their use.

Following this discovery, new contributions were scarce until the history-making proof of the germ theory by Louis Pasteur, and its practical application by Lord Lister, in the midportion of the nineteenth century. The discovery of anesthesia (ether by Long in 1842) supplied the last link in the rapid development of surgery. The discovery of antibiotics was, of course, a great boon to the surgeon, since postoperative infection had previously been a serious complication in spite of our knowledge of asepsis made possible by the work of Pasteur and Lord Lister.

Epidemics

Until a few decades ago, epidemics of numerous diseases plagued the world and caused the deaths of millions of people. Unquestionably these catastrophes exerted a tremendous influence on the development, or lack of development of civilization, because of decimation of the population and the fear engendered in the minds of those surviving. For the sake of convenience and comparison, I shall separate my brief discussion of these medieval calamities into a discussion of European and American epidemics.

European epidemics—As intimated, epidemics of numerous types, some of which are identified with difficulty, have swept Europe for as long as there are historic records. For example, at the height of a plague epidemic in Rome, 10,000 people died in one day. Scarcely a year went by but that some portion of Europe was swept by one of the 8 or 10 more serious diseases appearing in epidemic form. However, by the middle of the sixteenth century sweating sickness, leprosy and cholera had almost disappeared from Europe. The most formidable epidemics in the sixteenth century were syphilis and the plague, the latter being particularly severe in Germany, Italy and France between the years 1500 to 1568. By the latter part of the sixteenth century, syphilis was coming under control, largely because of the introduction of mercury therapy, especially as an inunction. Gonorrhea became widespread about 1520. The increased incidence of gonorrhea and syphilis at this period led to the closing of public baths for both sexes.

Barber surgeon cutting a mastoid abcess. 16th century England

FIGURE 3.

Typhus epidemics were severe in Italy in 1505 and in the years between 1524 and 1530. In the latter half of that century the disease was also bad in England. The small town of Oxford lost 510 of its inhabitants during one epidemic. Cholera, at its height in 1853 and 1854, killed 150,000 people in France.

One of the worst diseases from the standpoint of number of people killed was smallpox. It is estimated that during the eighteenth century 60,000,000 people in Europe died from this disease.[2]

Of about equal importance from the standpoint of deaths is plague. Some of the more important epidemics of plague, as given by Garrison,[3] are covered in table 1.

Although, during those times, people knew practically nothing about the etiology of the diseases which resulted in such devastating epidemics, they did know there was a certain contagious element present. Sanitary regulations became very severe. Houses in which victims died from epidemic disease were often burned to the ground. Persons not observing usual precautions in asepsis were actually put to death. Physicians delegated to treat the

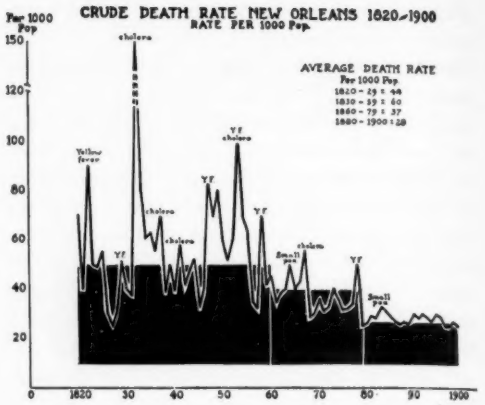


FIGURE 4. New Orleans had a terrible mortality record from epidemics, with a mean death rate of over 60 per 1000 for more than 30 years. (After Winslow et al.)

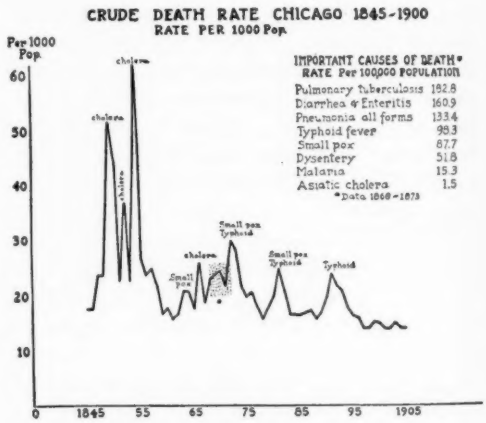


FIGURE 5. Chicago's epidemics lasted from 1848 to 1890. Again, cholera, smallpox and typhoid fever were the destroyers. From 1868 to 1873 the important causes of death were tuberculosis, infant diarrhea and pneumonia. (After Winslow et al.)

TABLE 1

PLAGUE EPIDEMICS

CITY	YEAR	DEATHS
London	1665	69,000
Vienna	1679	70,000
Milan	1630	80,000
Prague	1681	83,000
Moscow	1601	127,000
Venetian Republic	1630	500,000*

*Led to downfall of the power of Venice

AMERICAN EPIDEMICS

TABLE 2

DISEASE	LOCATION	YEAR	DEATHS
Smallpox	Mexican Indians	17th century	3,500,000
Smallpox	Boston	1720	2,880
Diphtheria	New Hampshire and Maine	1735-1739	2,000
Yellow fever	Philadelphia	1793	4,000
Cholera	New York	1853-1854	4,000

plague wore a very peculiar garb consisting of a red or black gown, often made of leather, leather gauntlets and leather mask with glasses covering the aperture for the eyes.

American epidemics—The first American epidemic (related to our civilization) occurred among the Indian tribes before the Pilgrims landed. Captain Derner, an English adventurer, passed the winter of 1618-19 in a New England Harbor and observed it. The epidemic, which quite certainly was smallpox, reduced a tribe of 9000 Indians to a few hundred survivors. In the seventeenth century smallpox killed 3,500,000 Indians in Mexico, and, according to some authorities, killed half the American Indians over a period of several years.[2] In 1720 smallpox killed about half the inhabitants of Boston, who then numbered about 5,759 (table 2).

All major cities had epidemics of varying severity (figures 4 and 5). In general the seaports suffered most. In 1793 close to 4000 people died in Philadelphia from yellow fever. About 11,000 persons, or 25 per cent of the population, contracted the disease. It is interesting that Dr. Benjamin Rush, one of Philadelphia's most famous physicians, attributed this epidemic to a pile of rotting coffee on Ball's Wharf.

From 1735 to 1739, diphtheria was particularly common in New Hampshire and Maine, killing 2000 of a population of 29,000.

In 1853 and 1854, cholera killed 4000 people in New York City.

Vaccination for smallpox was introduced about 1800, but it was not widely accepted in the United States because it was done from arm to arm, with the result that such diseases as syphilis, erysipelas and virulent infections were transmitted. Calf lymph was not available until about 1870. Yet the Indians must have used arm-to-arm vaccination since one of their tribes is credited with sending Dr. Jenner a belt and a string of wampum as an expression of appreciation for the conservation of many lives by vaccination.[4]

The explanation given by physicians for these epidemics was indeed bizarre. One of the most common explanations was the presence of putrid material in the neighborhood.

TABLE 3

UNITED STATES TRAFFIC AND KOREAN WAR CASUALTIES

(June 24, 1950 to August 3, 1953)

	AVERAGE PER YEAR	
	Deaths	*Injured and Missing*
Traffic	37,096	1,290,320
Korean War	8,053	37,096

TABLE 4

ACCIDENTAL DEATHS AND INJURIES*

(1952)

CAUSE	DEATHS	INJURIES
Automobile	38,000	1,350,000
Falls	20,400	
Drowning	6,800	
Fire	6,700	
Railroad accidents	3,200	
Firearms	2,350	
Other types	19,900	
TOTAL	97,350	9,600,000

*Accident Facts, National Safety Council, 1953

The public was so convinced of the contagious element that they would walk in the street instead of on the sidewalk to keep as far away as possible from homes housing sick people, and would avoid each other on the street. Hand shaking was abolished almost completely.

In spite of the heavy toll exacted by the epidemics, pulmonary tuberculosis was actually the disease causing most deaths, accounting for one-half to one-fourth of all deaths. The death rate from this disease ranged from 350 to 400 per 100,000 population.

Modern Accidents, Health and Social Problems

When we look at the health records of ancient and modern times, we may do so with a certain degree of pity and with lack of respect for the failure of the people to understand their problems. However, please bear in mind that ignorance of causation and cure of disease led to most of the unfortunate circumstances I have brought to your attention. I wish now to discuss some modern data and want to call to your attention the fact that

TABLE 5

DEATH RATES PER 100,000 POPULATION*

CAUSE OF DEATH	1950	1900
Heart disease	354	137 (3)
Malignancy	139	64 (7)
Cerebrovascular disease	104	107 (4)
Accidents	60	72 (6)
Nephritis	47	81 (5)
Influenza and pneumonia	29	202 (1)
Tuberculosis	22	194 (2)

The number in parenthesis in the 1900 column indicates the relative frequency of the more important causes of death during that period.

*U.S. Vital Statistics reports of Department of Health, Education and Welfare

ignorance does not explain all of them; we must blame our lackadaisical attitude for some of these unfortunate conditions.

One of the first calamities of modern times which I wish to bring to your attention is the murderous death rate in automobile accidents on the highways. Please note (table 3) that the average yearly death rate from automobile accidents (United States) during the three years of the Korean War was 37,096, compared with only 8,053 (U.S. troops) per year killed in military action. The number of persons injured in automobile accidents was more than 30 times greater than the number of injured or missing military personnel (U.S.) in the Korean War. Much lamentation has been expressed about the "needless" sacrifice of lives in this war, but very little is said or done about the "needless" sacrifice of lives on the highway, except that in certain localities the police are more strict about the enforcement of the speed laws and other traffic regulations.

In 1952, next to automobile accidents, the most common cause of accidental death was "falls" (table 4). It is exceedingly important from a prophylactic standpoint to know that two-thirds of these accidents occurred in the home, and 72 per cent occurred in people 65 years of age or older.

The total number of accidental deaths for 1952 was 97,350 and of injuries 9,600,000. It has been estimated (National Safety Council[5]) that the over-all cost of these accidents to the nation was $8,700,000,000; this includes a wage loss of three billion dollars. The expense for medical fees and hospital care is approximated at $600,000,000.

Our death rate from disease has improved markedly during the past 50 years (table 5). This improvement in prevention of deaths has been responsible for lengthening life expectancy from 48 years in 1900, to over 68 years in 1950. Needless to say, the incidence of the various causes of death has changed and in certain cases is reversed. In 1900 pneumonia (and influenza) and tuberculosis were the two most common causes of death. In 1950 they were the least common of the seven most common causes of death. As might be expected from the results of markedly increasing the life span, heart disease and malignancy (diseases confined primarily to elderly people) are now the two most common causes of death.

TABLE 6

DEATHS IN CHILDREN, AGED 1 TO 14*
(1950)

Accidents	10,313
Malignant disease	3,156
Pneumonia	2,821
Congenital malformations	2,014
Tuberculosis	1,263
Poliomyelitis	862

*Accident Facts, National Safety Council

A study of causes of death in children may reveal facts surprising to many of you. In table 6 are listed the number and causes of deaths in children, age 1 to 14, for 1950. Accidents accounted for many times more deaths than any other single cause. Second in frequency of cause of death was malignant disease. This may be surprising to many, since malignant disease is considered to be a disease of old age; these figures prove the fallacy of this statement. One hears so much about the ravages of poliomyelitis that it may be surprising to learn that in the United States this disease accounted for only 862 deaths in 1950. Many people have temporary paralysis following poliomyelitis, but surprisingly few have permanent disabling paralysis. We must

not forget the loss of limbs and eyes resulting from accidents and surgery for malignant disease. The death rate and residual paralysis of poliomyelitis have been exaggerated by propaganda. Loss of limb from accident or malignant disease is more disabling than partial paralysis. One need but look around in the families of your acquaintances and friends to realize also how important the disability of congenital malformation can be.

Hospital facilities have more than kept pace with the improvements in health records. Table 7 indicates that there were 6,430 hospitals in the United States in 1950, and 6,665 in 1952. The nation has 585 psychiatric hospitals with 704,056 patients, a figure equal to half the hospital capacity. It must be realized, however, that most psychiatric patients remain hospitalized for years, whereas the average duration of hospitalization in civilian hospitals of other types is slightly less than two weeks.

I wish to emphasize that by no means all of our welfare troubles are related to health and disease. Social problems are vital, and some are increasing in importance from year to year. It is very unfortunate that about one out of four marriages results in divorce, particularly since the family involved so often has children. However, I doubt that very much can be done about the incompatibility of husband and wife until we learn how to control and mold personalities. That day is certainly not near.

Many other serious social problems are vital to our everyday existence and could be solved, if we had the will or will power. Does it surprise you to know that the cost of alcoholic beverages per year in the United States is between 6 and 7 billion dollars? None of us would begrudge the temporary boost in morale and feeling of well-being afforded by alcohol, but when we realize that the money spent for alcohol is three or four times the amount of money spent on education, surely it is time to stop and think. Is it more important to supply our children with alcoholic beverages than with education?

We can enlarge considerably on the sad plight of education; all these comments add still more to our embarrassment about our inertia in coming to the rescue of education. Every dollar spent on education is watched with a very scrutinizing eye. Are we as careful about expenditures for our pleasures and luxuries? I would like to emphasize that movie actors and actresses are paid 20 times as much as college professors. We pay elevator operators as much or more than we pay our school teachers. It takes 10 minutes to learn how to operate an elevator and 5 to 10 years to learn how to become a teacher. Yes, of course, this is a serious inequity. It cannot be called the fault of any one individual. If so, it could be corrected readily. Unfortunately, these inequities are the fault of the mass of people; all of us are guilty. Correction can scarcely be accomplished until the majority of people rise up in protest.

Accordingly, I am making a plea that we do not treat education like a stepchild. Our progress and welfare depend on it. It must receive much greater support lest we become a prey to the philosophy that the individual need not accept any responsibility for his own welfare. If that day should arrive, our nation would slump to the depths of despair, misery and misfortune.

TABLE 7

HOSPITALS AND HOSPITAL BEDS IN UNITED STATES

	1950	1952
Hospitals	6,430	6,665
Hospital beds*	1,456,912	1,541,615
Hospital admissions†	17,023,513	18,914,847

*71.3 per cent in government hospitals.
†27.3 per cent in government hospitals.
(Difference is due to number of psychiatric patients. The United States has 585 psychiatric hospitals with 704,056 patients, or 53.7 per cent of the patient load in all hospitals.)

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Editorials

Postgraduate Medicine

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WHY ARE YOU ALLERGY-RESISTANT?

To those of us who have been working in this field for the past 20 years and have viewed the field of allergy with an honest and broad-minded approach, it is very difficult to understand the antagonistic attitude that exists in the minds and practices of a great many physicians.

True, the majority of physicians practicing now have had absolutely no instruction in allergic diseases. The younger men have had very limited instruction as students—in some medical schools, none at all—so that knowledge of this subject can be gained only on a postgraduate basis. The opportunities to procure this knowledge are quite limited. A few medical schools offer short postgraduate courses, and the two national allergy societies offer short concentrated instructional courses each year. These courses are well attended and well received, but there should be more of them.

A few years ago, the otolaryngologists were quite antagonistic to recognizing and treating the allergic diseases they encountered. Of late, they seem to have become more broad-minded and realize that the best results are obtainable by combining their knowledge and experience with those of the allergist.

The pediatrician is extremely resistant and reluctant to consider the allergic state. Repeatedly, the story comes to us from the parents that their pediatrician has told them that their child will "outgrow the disease." They do, at times, but in the course of outgrowing the disease the child suffers a lot of misery. This is particularly true of those children with atopic eczema. Many of these children, in outgrowing their eczema, become asthmatics, and many of the asthmatic children become chronic asthmatics with emphysematous chests for which nothing can be done.

The dermatologist is also allergy-resistant. In this field, it is absolutely impossible to treat a great many skin diseases honestly without the application of allergic methods.

The psychiatrist feels that all allergic disorders are psychic and that they are perfectly capable of handling the situation. "Maternal rejection" and "frustration" are considered the basic causes.

Most cases of migraine are treated by psychiatrists. Yet it is generally admitted that there is an allergic background in most cases of migraine. However, patients are never subjected to complete allergic studies. "Complete allergic study" does not mean a series of 150 or more scratch tests. Such tests may be done first, but they should be followed by intradermal tests, history and the clinical corroboration of positive findings with clinical symptoms.

It is also essential for the internist, the surgeon and physicians in practically every branch of medical practice to have some

knowledge of the basic principles and management of allergic diseases.

Certainly some cases are absolutely psychic, some are partially so, but it is our duty, as investigators, to exhaust all physical means of investigation at our command before we accept the psychosomatic etiology.

Practically every child brought to us for treatment is an unhappy, apparently psychically upset individual. These children are made happy, cooperative citizens in the great majority of instances by applying the principles of common sense plus thorough allergic studies.

Cooperation, broad-mindedness and an honest approach to these problems will lead to a vast improvement in the treatment of many of these conditions. It is conceded that, at the present time, 10 per cent of the populace is seeking relief from allergic diseases. If this is true—and there are not many who dispute it—then it behooves all of us to learn as much as we can about the diagnosis and treatment of allergic diseases and to do the proper thing about it.

HARRY L. ROGERS

EARLY EXPERIENCES WITH CHOLINE

In an extraordinary and memorable article, published in *Nutrition Reviews*[1] for November 1953, Dr. Charles H. Best of the University of Toronto recapitulates the steps which led to the discovery that choline can prevent pathologic fatty changes in the liver. This recognition, he says, was a direct outcome of the discovery of insulin, for Banting and Best had noted the large yellow livers of untreated completely depancreatized dogs in 1921. (Incidentally, a similar observation was made by von Mering and Minkowski in 1889.)

In 1922 diabetic fatty livers were restored to normal by administration of insulin. The most obvious abnormality in the test animals was the lack of pancreatic enzymes. When beef pancreas was included in the diet of a dog, a fatty liver did not develop.

Through research by Hershey and Soskin, evidence was developed that phospholipids are concerned with the transport of fat, and the hypothesis was advanced that a failure in fat metabolism in depancreatized dogs rather than a defect in digestion might be responsible for the large fatty livers of the insulin-treated animals.

Since experiments on depancreatized dogs were time-consuming, expensive and difficult, the investigators placed rats on a high fat and low protein diet and found that fatty livers developed within three weeks. With these new test animals, the investigators found that lecithin exerted a definite effect on the deposition of liver fat in the rat. Shortly thereafter a note was published identifying choline as the active constituent of the lecithin molecule. By this time investigators all over the world were "hot" in pursuit on the many trails opened by these original discoveries. Many of the original investigators who had first become interested in studies at the University of Toronto extended their work into other laboratories.

In his interesting essay, Dr. Best comments on the various leads which developed from the original observation. These comments are so striking that they are reported here in their entirety:

> Looking back from the vantage point which we have now gained it is apparent that the nature of the substances responsible for the lipotropic activity in minced-beef pancreas might have been effectively attacked in any one of several ways. If the protein fraction of the pancreas had been fed to rats on diets rich in fat, the lipotropic activity of methionine-containing protein might have been found earlier. If a more thorough study of the administration of enzymes obtained from the pancreas had been carried out in the insulin-treated depancreatized dogs, the indirect lipotropic action of these substances, later so effectively elucidated by Chaikoff and his colleagues, would presumably have been recognized. I have described very briefly the route which was actually followed in the recognition of the lipotropic

activity of choline, betaine, methionine and inositol. It has become more and more apparent that choline provides an essential part of the pathway which methionine and betaine must use in the production of their lipotropic effects, but a discussion of these and the many other fascinating interrelationships involving the sources of the methyl group, vitamin B_{12}, etc., would take us too far afield. It is a great satisfaction that this aspect of fat metabolism developed by many laboratories over the past 21 years has been such a useful tool with which to reveal new vistas in physiology, biochemistry and pathology.

The study illustrates beautifully the manner in which modern technics of research bring to light new facts regarding the physiology of the human body. The ultimate result is a synthesis of the efforts of many investigators, often working far apart, who, nevertheless, are able to coordinate their work through modern methods of communication in the field of science.

MORRIS FISHBEIN

1. Best, Charles H.: Early experiences with choline—a retrospect. Nutrition Rev. 11:321-323 (November) 1953.

THE DOCTOR AND SOCIAL SECURITY

In September 1953 the International Social Security Association held a meeting in Paris at which attention was given particularly to the relationships of physicians throughout the world to social security.

The representatives recognized the importance of medical secrecy but decided, nevertheless, that a communication by a physician to an official, duly designated by a social security institution to receive such medical information as the institution might need for proper fulfillment of its obligations, should not be considered a violation of medical secrecy.

The meeting also recognized the tremendous financial drain on social security institutions of demands by patients for new drugs and even went so far as to express the desire that research should be utilized to insure the maximum benefit for the whole population and particularly for those insured. For protection they urged legislative regulations of the production and sale of pharmaceutical articles and control of their prices, elimination of medicaments which are too expensive in relation to other medicaments of equal effectiveness, limitation of advertising and publicity for drugs and curative treatments, and supervision of publicity in the lay press for new drugs. Particularly, a warning was issued against publicity in periodicals which might be mistaken for disinterested scientific articles.

The meeting adopted certain conclusions concerning the relations between social security institutions and members of the medical profession which indicate a point of view concerning medical practice somewhat at variance with that which prevails in the United States. The activities of the doctor in social security are held to be a social service and presuppose that the doctor should maintain economy in his work compatible with the utmost therapeutic efficiency. Social security organizations are urged to draw up agreements with physicians and medical associations providing for compulsory arbitration.

The meeting recognized four methods of compensation for physicians under social security plans now prevailing. These include (1) direct provision of benefit; (2) direct payment to the doctor; (3) reimbursement to the insured person, and (4) a combination of these methods. They recognized that a direct provision of benefits requires limitation to physicians who practice for a fixed salary on behalf of the social security institution. They believe that free choice is possible among physicians recognized by the social security institution under the system of direct payment of the doctor. They point out, however, that special rules must be drawn up for practice by specialists. They assert that the fees fixed should be strictly adhered to by physicians.

Social security institutions, the assembly decided, should have the right to establish diagnostic and medical care centers. Empha-

sis is placed on the point that a satisfactory medical care service is possible only if there is a rational, geographic distribution of the doctors over the territory and if their number corresponds to the needs of the population. Physicians, it is said, should be remunerated so as to attain a standard of living corresponding to their social position. Furthermore, physicians should hold positions on joint committees concerned with problems of common interest to the medical profession and the social security organization.

Another resolution was adopted urging that all universities and other competent educational institutions should include compulsory courses in social medicine in their medical and surgical curriculums and should provide suitable training for students in this important subject.

Extended consideration was given to the evaluation of invalidity and incapacity and the role played by the physician in such evaluation.

Obviously the continued expansion of social security methods throughout the world and the various pressures brought by organized labor, bureaucratic agencies, social groups and others to extend such provisions to more and more people concern the medical profession more than any other professional agency. The medical profession must provide medical service. Physicians will do well to be aware of these movements and to make certain that their point of view is properly presented whenever such matters are under consideration.

MORRIS FISHBEIN

DO WE TAKE EACH OTHER FOR GRANTED?

RECENTLY, the Medical Association of one of our states celebrated its hundredth anniversary. At that time, Janus-like, it looked backward at its past and forward to its future. In the process of thoughful review and forecast, it had occasion to look upon its achievements with pride and satisfaction, to anticipate its future development with confidence and assurance. Its contribution, along with that of the physicians of the country, to the welfare of mankind had been miraculous. It had been instrumental in lengthening measurably the life span of man, in reducing the infant and maternal mortality rate, in controlling many communicable diseases, in furthering research along many lines, in developing miracle drugs, in treating millions of patients daily, and in extending medical knowledge and know-how throughout the world.

On this anniversary occasion, this Medical Association focused the spotlight, and rightly so, on the doctor. It seems, however, that slight, if any, reference was made to other members of the health team—to chemists, to physicists, to nurses, to hospital administrators, et al. And being human, these other members tended to ask, "Where do we come in?"

This situation gave cause for serious thought. Why, in its accolade to itself, did this Medical Association make no mention of the nurse, for example?

Perhaps the nurse was on the defensive! But, it so happened that shortly thereafter a Hospital Association representing several states held its annual meeting. One page of the program was devoted to a graphic portrayal of the hospital patient in the center of the page surrounded by many figures representing the hospital personnel contributing to his welfare. Among the myriad personnel were the hospital administrator, the social worker, the physical therapist, the nutritionist, the nurse, et al.—but not a sign of a physician.

A short time later, a large group of nurses, in discussing the care of patients and the many groups contributing to that care, also made a list, and the group was quite sizeable. Here, too, no physician was on the list.

In the experience of many, these situations are not isolated. The question then seems obvious. Does the doctor take others for granted? And, in turn, do both the hospital and the nurse, for example, take the doctor for granted? Do we all take each other for granted and, if so, should we? Or, can the physician and, in turn, the hospital and the nurse, "each in his own tongue," find ways of giving expression to the appreciation each

of us feels for the work and contributions of others?

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PROBLEMS OF ADOPTION

THE World Health Organization, in a final report* on a meeting of experts on the mental health aspects of adoption, provides useful information and important philosophical considerations. Adoption is regarded as the most complete means whereby family relationships and family life may be given to a child in need of a family. The main purpose of adoption is to insure the well-being of the child and, secondarily, to satisfy the desire of childless people for children. Children who are adopted may be orphans or may have a mother who wishes to marry again after the death of a father. Some children are adopted to relieve them of unsatisfactory circumstances for living because of various misfortunes that may have occurred to their parents. The mass of adoption relates to illegitimate children. One of the most difficult problems concerns the child who has brothers or sisters and the question of arranging adoption for one member of such a family group with complete separation from the others.

Among points which were considered in detail were the quality of parental feeling in adopting parents, the quality of their marital relationship, the age of the adopting parents and of the child, the presence in the adopting family of other children, the relationship to the new parents, the question of religion, legal questions, questions of nationality and the possibility of the annulment of adoption. The adopting parents should be capable of warm love and of family feeling. Agencies must be certain that the prospective father and mother have a real marital relationship so that they may share in planning for the child and not make the child the scapegoat for bitterness, or guilt or unsatisfactory relationships that may exist between the couple. Special significance is attached to the age of adopting parents. Normality is furthered when their age is related to what would probably be the natural age of parents for the child. The objection to the adopting parents being as old as 50 lies in the possibility of their being too old to understand the problems of the young generation. There is also the question of their dying and leaving the child orphaned and again without a family. The expert committee says, "No child should wittingly be exposed to such a repetition of his earlier experience or to the risk of such misunderstanding."

The expert committee feels that the presence in the family of other children, whether natural or adopted, may constitute a normal setting for a child; usually it is best for a child to arrive in a family as the then youngest member. For the sake of the integrity of the child's relationship with his adopting parents, experts agree that the child should be aware from a young age that he is adopted and accepted.

In assessing the quality of a home, the authorities feel that it is desirable for a child to be placed in a home of a similar faith to his own, where this is known, or of the religion chosen by his mother. The nationality, similarly, should be such as to give the most adequate sense of security to the child.

Careful consideration is given to the question of annulling an adoption after it has been legalized. In some countries it is still possible for adoption to be annulled. Either the child or the adopting parents can ask for annulment. The grounds on which parents seek annulment include antisocial or reprehensible behavior on the part of the child, criminal behavior, ingratitude toward the adopting parents, mental disorder, feeblemindedness, hereditary disease or severe incurable physical illnesses. The possibility of annulment naturally constitutes a severe threat to the child's confidence and security. When difficulties occur, adoptive parents are encouraged to use whatever services are available in the community for all children in an effort to overcome these difficulties.

The expert committee was particularly con-

*Joint UN/WHO Meeting of Experts on the Mental Health Aspects of Adoption. Final Report. Technical Report Series No. 70. World Health Organization, Geneva, September 1953.

cerned with assessments of a child from the point of view of its mental capacity and its physical condition and also as to various hereditary factors. Appraisals of intellectual potentialities include tests of functioning, data which may throw some light on trauma occurring at birth, developmental histories, record of illnesses, and knowledge, if possible, of the intellectual level of the parents. Pediatricians who have followed children through a long period of time, psychiatrists, neurologists, psychologists and social workers need to look into these matters. Major emphasis should be put on closer scrutiny of adopting parents. From the point of view of heredity, no amount of speculation can substitute for a complete assessment of the child. Physical or mental illness related to hereditary factors should be sought. In the past adoption of handicapped children has been discouraged, but now this appears more of an effort to protect parents from risk than to make healthful circumstances available to particularly needy children. In actual experience, adoptions of this kind have been found capable of turning out well, provided the child's needs and the suitability of the home are closely studied.

MORRIS FISHBEIN

"THE BOY AND THE DIKE"

In 1865, Mary Mapes Dodge wrote a story about a boy in Holland who one night discovered a trickle of water coming out of a dike, and who put in his finger to prevent it from enlarging and thus prevented the ocean from inundating the land. He remained in this position all night, his thumb and hand, and finally his entire body, becoming numb and cold. Eventually a clergyman came to save him. A similar story has been repeated in other countries. Dr. Alexander Grinstein* of Detroit wrote to Holland trying to trace the tale and discovered that the whole story is an invention and has no basis in fact. The story is, however, most popular throughout the world, and in Holland a monument to the little boy was erected in the little village of Spaarndam and dedicated by Princess Margriet, third daughter of Queen Juliana, in June 1950.

Of course, the story is silly because anyone who has ever seen a dike knows that it could not happen. Several writers have suggested that the little boy would have done better to imitate Little Jack Horner who made better use of his thumb. The only means of stopping a leak in a dike is by a large bag of sand.

Dr. Grinstein analyzes the story and comes to the conclusion that the little boy was motivated by the fact that he was a bed-wetter and that he was simply trying to hold back his own urine to prevent a flood. Coupled with this was a feeling of aggression against his father, over whom in this way he triumphed, because it was his father's business to protect the dikes. At another level his action represented his triumph over "his own infantile instinctual impulses." Well, that's psychoanalysis!

MORRIS FISHBEIN

*GRINSTEIN, ALEXANDER: The boy and the dike. Internat. J. Psychoanalysis 34:265-270, 1953.

CARDANO, DISTINGUISHED PHYSICIAN AND GAMBLER

Gerolamo Cardano, known in English as Jerome Cardan, was born in 1501. His father was widely known as a lawyer in Milan who had also a knowledge of medicine, mathematics and magic. Leonardo da Vinci notes that he consulted the elder Cardano on geometric questions. When he was an old man, Jerome Cardan wrote his autobiography which, although betraying some signs of senility, is one of the classic medical autobiographies. His autobiography is full of the intimate details of the various fluxes, ruptures, kidney disturbances and palpitations of the heart from which he suffered, even down to an infection of the nipple. Incidentally, he lamented that he was sexually impotent from the age of 21 until the time of his marriage at 31.

At the age of 25, Cardano completed his university studies and failed in his first ap-

plication for the degree of doctor of medicine, but eventually the College of Physicians in Milan accepted him. He settled for a while as a country doctor a few miles outside of Padua. At first he lectured on mathematics and published two mathematical books. He treated patients and his first medical book was entitled "On the Bad Practices of Medicine in Common Use." A recent biographer writes that "Within a few years, Cardano was rector of the Guild of Physicians and was without question the most prominent physician in Milan."

Before he was 50 years old, Cardano was second only to Vesalius among European physicians. He served the Pope and many members of royalty in Europe. Incidentally he was called by John Hamilton, Archbishop of Scotland, who suffered from suffocating attacks of asthma which had grown steadily worse. Cardano seems to have suspected the allergic character of the asthma from which Archbishop Hamilton suffered. After spending more than a month observing the symptoms and habits of the prelate, Cardano wrote out recommendations which included rest from overwork, sleep, a change of diet, baths and good personal hygiene, but he seems to have achieved success by insisting that the Archbishop should not sleep on feathers as was customary but on silk and if the silk mattress proved too hard, Cardano recommended that several should be placed on top of one another. He insisted also that the pillow should be made of linen and not of leather. The Archbishop's health improved immediately. The attacks of asthma appeared only rarely with intervals of months of relief.

In 1552, for this consultation, he traveled through France, to London and, on the way homeward, through Antwerp, Cologne, Strasbourg and Basel. The consultation in Edinburgh was most satisfactory and he received a fee of 1800 gold crowns and a heavy gold chain as a personal gift. He also had many other consultations.

Cardano wrote on mathematics, astronomy, physics, morals, chess, the soul, music, death, and also extensively on games of chance such as dice and cards. More than half of his books were on medical subjects.

The most recent biography of Cardano comes from the Princeton University Press and is by Oystein Ore.* It includes a translation from the Latin of Cardano's "Book on Games of Chance," translated by Sydney Henry Gould. The book opens with a quote from Cardano's book on gambling in which he says, "Even if gambling were altogether an evil, still, on account of the very large number of people who play, it would seem to be a natural evil. For that very reason it ought to be discussed by a medical doctor like one of the incurable diseases."

In the third chapter of his book on gambling, Cardano discusses the opinion that "lawyers and doctors gamble at a disadvantage. If they win they may be called gamblers. If they lose, they incur the judgment of the rest of the people and they think they are no better in their profession than at the play." And he continues that statement by saying, "They may run into the same adverse criticism if they devote themselves too assiduously to music."

Music seems to have been Cardano's chief recreation but gambling was an obsession with him. His mathematical ability seemed to make him quite successful in his gambling.

Cardano is credited with having given the first clinical description of typhus fever which he called fleabite fever because of the form of the skin lesions rather than because of any knowledge of the way in which typhus is transmitted. He wrote on syphilis and made some psychiatric observations. He advocated the liberal use of shower baths.

His was an original mind and posterity does not seem to have accorded him the recognition that is due him.

MORRIS FISHBEIN

*Ore, Oystein: Cardano, The Gambling Scholar. Princeton, New Jersey, The Princeton University Press, 1953.